JANJA STOVE RENEWABLE SOURCE OF ENERGY FOR SUSTAINABLE ECONOMIC DEVELOPMENT: A CASE OF MAJI YA CHAI COMMUNITY WOMEN TRAINING IN ARUSHA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS FOR THE DEGREEE OF MASTER IN COMMUNITY ECONOMIC DEVELOPMENT OF THE OPEN UNIVERSITY OF TANZANIA

2014

CERTIFICATION

I, Dr. SIMON WAANE, certifies that I have read and hereby recommend for the acceptance by the Open University of Tanzania (OUT) a project entitled, Janja Stove Renewable Source Of Energy For Sustainable Economic Development: Maji Ya Chai Community Women Training In Arusha in partial fulfillment of the requirements for the degree of Master of Community Economic Development of the Open University of Tanzania.

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Dr. Simon Waane

(Supervisor)

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Date

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DECLARATION

I, Harrison E. Chonjo hereby declare that this project is my own original work and that it has never been submitted for the similar degree in any other University.

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Signature

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Date

DEDICATION

To my beloved family, My Aunt Agnes A. Chonjo, my young sister Beatrice Mosha, Glory Chonjo and Lightness Chonjo, my niece Michelle, and my parents Mr. & Mrs. Elisonguo Chonjo and my brother Michael, Silas and Sifaeli and Prosper,.

ABSTRACT

Energy is one on the resource that human being/community use in daily life. The consumption of these energy counts on daily living cost and determine standard of living. Renewable energy sources are one of the friendly sources of energy in various spheres like; economic, health and environment. The main objective of this study was to assess the sustainability of Janja stove in the community by analyzing it financial advantages. Still there is a big existing gap in between the users and suppliers of renewable energy. Both public and private institution have to assort their effort together in promoting renewable energy not only for sustainable economic development but also for environmental and health security. The survey was carried out in Meru District in Arusha City between September 2013 and June 2014 in collaboration with the CARMATEC and ATC. It involved 117 respondents from Maji ya Chai ward and 7 village executive officer's. The principal methodology used in this study was descriptive statistics where various tools were used include interviews, Questionnaires, Focus Group Discussion and Key Informants Interviews. The study suggest various mitigation to the problem; by conducting Community training on importance of renewable energy, The government should provide both financial and technical support to the isolated communities, Research on other renewable energies should be done so as to propel development in the community, Produced products should be customer oriented rather than producer oriented

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ABREVIATIONS

ATC	Arusha Technical Collage
ACC	Arusha City Council
CARMATEC	Center for Agriculture Mechanization and Rural Development
CBOs	Community Based Organizations
CSOs	Civil Society Organizations
DFID	Department of Foreign and International Development
EAC-EASU	East African Community-East African Strategy To Scale-Up Access To Modern Energy Services
EAC-EASU	East African Community-East African Strategy To Scale-Up Access To Modern Energy Services
EEA	European Environmental Agency
EEA	European Environmental Agency
EU	European Union
EUEI PDF	European Union Energy Initiative Partnership Dialogue Facility
FAO	Food and Agriculture Organization
GHG	Green House Gas
GTZ-Deutsche	Deutsche Gesellschaftfür Technische Zusammenarbeit

IEA	International Energy Agency
KM	Kilometers
MAMC	Masdar A Mubadala Company
NBS	National Bureau of Statistics
BCBRW	Burundi Country Baseline Report Work plan
EUREL	European Electro technical Federation
KIA	Kilimanjaro International Airport
MDG's	Millennium Development Goals
NEPA	Nigeria Electric Power Authority
NGOs	Non-Governmental Organizations
PBOs	Peoples Based Organizations
PP	Per person
RES	Renewable Energy Sources
SACCOS	Saving and Credit Cooperative Societies
SUA	Sokoine University of Agriculture
TANESCO	Tanzania National Electric Supply Company
TAPS	Tanzania Adventist Primary School
TASS	Tanzania Adventist Secondary School
TaTEDO	Tanzania Traditional Energy Development Organization
Tsh.	Tanzanian shillings
TZS	Tanzanian shillings

UNDP	United Nations Development Programme
VEO	Village Executive Officer
WEO	Ward Executive Officer
WODSTA	Women Development for Science and Technology Association

CHAPTER ONE

1.0 COMMUNITY NEEDS ASSESMENT

1.1 Background information

According to DOE (2001), Renewable energy uses energy sources that are continually replenished by nature - the sun, the wind, water, the Earth's heat, and plants. Renewable energy technologies turn these fuels into usable forms of energy. Using renewable sources make easier for the user to replace the energy. This is only possible with enlighten education basing on technology. The use of non-renewable sources brings the burden to the community as community strives on using massive of non-renewable energy sources.

Energy is one of the most essential needs of community in the world. Energy source differs from one geographical location to another one, mostly resources available determines type of energy consumed in a given area. The concept of energy is a global debate, Government and Non-Governmental agencies are conducting projects on energy which are renewable and friendly to the environment. There is great need of adopting renewable energy which is friendly to environment so as to protect the global environment and reduce poverty.

Due to the population growth and poor income from many less developed countries, the use of firewood, charcoal and other non-renewable energies will increase and result more poverty and more environmental destruction, draughts, famine and death rate will rise.

According to Kersten, 1998, the energy crisis also spread in a wide range in Africa. Most of Africans are suffering from energy in which it bear a cost of living, environmental destruction as well as health problems. In rural areas, much of the energy production is from the burning of fuel woods. …There is a trend of deforestation in Nigeria at 300,000 hectares per year, deforestation is propagated due to fuel wood burning. The average time it takes one person (usually women) to collect enough wood for the day's meals (2.28 on averages) is 4-6 hours.

There is a great need of revolution particularly in cooking energy in Tanzania and Africa at large, the uses of improved stove will be cost effective and cooking efficient to the users. As the study stipulated above deforestation of 300,000 of hectares in Nigeria happen annually. The uses of improved stove like Janja stove will reduce the massive cutting down of trees as well as the time spent in collecting fire wood and eliminate indoor associated problems from burning energy. This will contribute a great development in economic, social and health sphere.

The overall efficiency of the commonly used three stone stoves is less than 10%. Despite the availability of more efficient stoves and cooking fuels, these alternatives have been adopted for both financial and cultural reasons (Kersten, 1998).

According to Magessa (2008), Tanzania is endowed with abundant energy resources and access that could be employed in modern energy cooking technologies and services for the poor. Such resources include biomass, solar, natural gas wind, flowing rivers, geothermal and coal. To date the following are estimates of the status

of use of modern energy services for cooking in Tanzania: About 40% of Dar es salaam City with more than 3 million residents use improved charcoal stoves and only less than 20 % use improved firewood stoves; According to WHO, nearly 28,000 deaths are attributable annually to indoor air pollution from solid fuel use which is responsible for 4.4 % of Tanzania's national burden of disease (2002).

Tanzania is enriched country with natural resources. There available resources that could be transformed into useful renewable form of energy. Provision of this energy to the poor and entire community will alleviate poverty by reducing daily maintenance cost and stimulate savings and development of other projects. From the report as it stipulated above by WHO nearly 28,000 deaths are caused by indoor air pollution, this increased Government cost on provision of medical services and loosing working force as well as losing tax payers.

Estimation of users of modern biomass cooking stoves (charcoal and firewood) in other urban areas is put at about 20%. Less than 3% of households in rural areas use modern biomass cooking services. Kerosene is utilized for cooking and estimates are put at less than 10% in urban areas and less than 1% in rural areas mainly by salaried employees. Electricity is less used for cooking. Availability and reliability of documented data on cooking using electricity is questionable, but it is not above 30% in urban areas and it is almost none in rural areas. Magessa (2008)

In Tanzania the adaptation of modern cooking energy technology is still at a low stage. The study conducted above stipulate that only 40% of population in Dar Es Salaam city populated with more than 3million residents used improved charcoal

stoves and only less than 20 % use improved firewood stoves. The study also conducted in other urban areas and found 20% and less than 3% of household in rural areas use modern biomass cooking stove. The rest population they would have utilize renewable source of energy if only they had technology transferred to them. Do to the high demand of cooking energy there is a great need of disseminating this technology to the entire rural and urban community. Renewable source of energy is not only suitable for the low income earners but also to the salaried population. This would provide room for environmental conservation and reduce the associated indoor air pollution death.

Tanzania is endowed with abundance of energy resources enough to provide power for the entire country. However, technological limitation, expertise and resource capabilities adversely affect transformation of these resources into useful form of modern energy

1.2 Community Profile

Candil, (2004) state that, ‘a community profile is an attempt to describe particular community or neighborhood. It uses variety of different techniques to build up a picture of the community from a number of perspectives. The purpose for doing a community profile can vary enormously but is normally orientated towards preparing the ground for an effective piece of community action. Comprehensive description of the Needs of a population that is defined, or defines itself, as a community, and the resources that exist within that community, carried out with the active involvement of the community itself, for the purpose of developing an action plan or other means

of improving the quality of life of the community''.

According to the Population and housing Census General Report (2012) Maji ya Chai is an administrative ward in Meru district of the Arusha city of Tanzania. The ward has a total population of 29,313 (14,143 males and 15,170 females) and household size of 4.6. Maji ya Chai is located 21Km from the Arusha city, it is connected by the Moshi to Arusha road 80Km away to the Kilimanjaro region boarder. The ward has a mixture of ethnic groups although the majorities approximately 90% of the residents are the Meru. (Field Survey (2014)

1.2.1 Geographical Location

Maji ya Chai is located 21km from the Arusha city, it is connected with Kilimanjaro to Arusha high way road 80Km way to the Kilimanjaro region. The ward is bordered by Arusha national park, Kikatiti ward, Nkoaranga ward and Ngarenanyuki ward, Maji ya Chai also is connected with Kilimanjaro International Airport (KIA) which is located at Arusha and Kilimanjaro region border. (Field Survey (2014).

1.2.2 Population Dynamics

According to the NBS (2012), Maji ya chai is an administrative ward in Meru district of the Arusha Region of Tanzania. According to the 2012 Population and Housing census, the ward has a total population of 29,313 (14,143 males and 15,170 females) and household size of 4.6. The ward has the mixture of tribes although the majorities approximately 90% of residents are the Meru tribe people. (NBS (2012). Maji ya Chai ward is one of the growing populations Ward in Arusha city, the population

growth increase the demand for area for settlement a well as cooking energy. This situation result into massive cutting down of trees for fire wood energy. (Field Survey (2014)

1.2.3 Economic Activities

Community involves itself into various economic activities for economic sustainability. The community has enough work force, 48.6% of population aged between 18-30, 27.1% aged between 31-40, 12.9% aged between 41-50 and 8.6% of population aged between 51-60. This provides community with large number of working population. (Field Survey (2014))

1.2.3.1 Agriculture

Maji ya Chai villagers are engaging in cultivation of various food crops and cash crops. The main food crops cultivated are maize, beans, banana, cassava, sweet potatoes, and rice. Horticultural also is one of the activities practiced by villagers due to the perpetual flow of water from Mount Meru high lands. Products like; tomatoes, cabbages, ginger, cucumbers, onions vegetables and flowers are constantly produced by natives and investors. Coffee is the main cash crop cultivated in Maji ya Chai ward and district wise. (Field Survey, 2014)

1.2.3.2 Animal husbandry

Community members practice animal husbandry. Various animals like cows, goats, sheep, and pigs are kept. Also chicken husbandry is one of common practice of Maji ya Chai villagers. Animal husbandry is mainly for households and commercial. Most

of people approximately 50% depend on food crops cultivation, 30% depends on livestock keeping and 20% of working population is employed in Government and non-governmental organization. (Field Survey 2014).

1.2.3.3 Lumbering

Maji ya Chai ward is surrounded by Mount Meru slopes forest, lumbering is also one of the economic activities. Government maintains the lumbering activities by managing tree nursery gardens for tree replacement. For a long period of time the place has become popular for lumbering in whereby it provided an employment opportunity for majority of natives. (Field Survey (2014).

1.2.3.4 Tourism

Arusha National Park is found in Maji ya Chai ward. The park has many attractions that attract flow of domestic and international tourist. Some of these attractions are; Ngarenanyuki river, the "*uwanja wa mbogo*" (Buffalos Glade), Tulusia waterfall, Fig tree Arch, Lower Montana forest, Kitoto camp and Meru crater. Tourist enjoys walking and canoeing safaris. Mount Meru climbing is another tourist activity in Meru district, a number of tourist climb the mountain in which employment opportunities and income to the government is generated. (Arusha National Park Brochure, 2014).

1.2.3.5 Trade

Trade is one of the economic activities conducted by Maji ya Chai villagers. The presence of customers from various institutions like; schools, universities, colleges

and other public and private institutions provide a big room for exchange at Usa river market place which is located near the Usa river Police station. Different kinds of consumer goods are sold at the market periodically every Thursday and Sunday. The market is famous for selling both agricultural and livestock products. E.g. vegetables, maize, beans and potatoes. Currently is the fast growing place, there is private investment in various areas like; Flower production (Kiliflora Company), Tanzania Poultry Farm, Ford Automobile selling company and coffee estates. (Field Survey, 2014).

1.2.4 CBOs/NGOs and Institutions

Various initiatives have been employed by the Government and non-governmental organization which led to the establishment of various social-economic organizations like World Vision running community social economic development projects, BRAC Foundation which it provide micro finance services, higher learning institution like University of Arusha, Tumaini University Makumira college. Various government schools like Ngongongare primary and secondary school, Tuvaila primary school, Maji ya Chai primary school, Kindatu primary school, Leku primary school, Imbaseni primary school, Kiwawa primary school.

Also there are several private school which are; Imbaseni technical college, Ailanga Lutheran Seminary School, Tanzania Adventist Primary School (TAPS), Tanzania Adventist Secondary School (TASS), Precious Blood girls' secondary school, Bishop Henry high school, Ngorika primary and secondary school, St. Jude primary and secondary school. (Source: Field Survey (2014)).

1.2.5 Socio-economic Infrastructure

The village has various community based organization (CBO) such as World Vision, University of Arusha, Government and private schools, Arusha National park. Also there are faith based institution Churches of different domination like Free Pentecostal Church of Tanzania, Evangelist Lutheran Church of Tanzania (E.L.C.T), Seventh Day Adventist Church (SDA), Roman Catholic church and various Mosque. Microfinance organization like Brac foundation, National Microfinance Bank (NMB), Meru Community Bank and Cooperative Rural Development Bank (CRDB) also persist to render micro finance to the community. Through this make a smooth way for the entrepreneurs to run their business activities through loan provided. Also there is one police station. (Field Survey, 2014).

1.2.6 Social Services

Social services are one of the challenges faces community members in Maji ya Chai. Government and non-governmental organizations initiate various projects to cater social services and ensuring economic sustainability of the community members. Community social services status is narrated hereunder;

1.2.6.1 Education

In Maji ya Chai ward education services are sufficiently provided by both Public and Private Organizations. From kindergarten level to higher learning institution community members enjoy the presence of various learning institutions like; Tanzania Adventist Primary School (TAPS), Tanzania Adventist Secondary School (TASS), Ngongongare Primary and Secondary school, Imbaseni technical college,

Maji ya Chai Secondary school, Ailanga Lutheran Seminary School, Precious Blood girls' secondary school, Bishop Henry high school, Ngorika primary and secondary school, St. Jude primary and secondary school. (Field Survey 2014).

1.2.6.2 Financial Services

Since Maji ya Chai is one of the fast growing up ward in Arusha, various micro-finance institution have been established to provide financial services to the community. Various institutions E.g. Meru Community Bank, BRAC foundation, National Microfinance Bank (NMB), National Bank of Commerce (NBC) and Cooperative Rural Development Bank (CRDB) have been established to provide financial services including loans to the small and medium enterprises. Through this community increase efficient in trade and propel community development. Rotating and saving capital (ROSCA) also kwon as Kibati is one of the coming up means of Maji ya Chai community members of acquiring capital. (Field Survey 2014).

1.2.6.3 Energy

Energy supply is one of the major problem for villagers in Maji ya Chai, three (3) house out of Ten (10) are connected with Hydro electric power. This problem brought difficultness for villagers in cooking, lighting and other power domestic use. Most of the people cannot afford to buy solar panels or other source of energy rather than depending on firewood and kerosene which is non renewable and less friendly to the health and environment. Through this land degradation as well as deforestation in the environment continues. Various NGO's introduced some renewable energy

like solar and biogas, but still more efforts are needed so as to spread the technology to the entire community. (Field Survey 2014).

1.2.6.4 Water Supply

Water supply is another second numbered problem in Maji ya Chai. Mount Meru slopes provide perennial flow of water in streams in Meru community. The streams play a vital role in horticultures and other development activities. Unfortunately the water is concentrated with fluoride. This hinders the community from using stream water for cooking neither drinking. There is no enough clean water supplies, high concentration of fluoride in water brought a challenge for villagers, the available clean water supply is not adequate as for housing and population persist. Villagers have to fetch clean water in a rotation according to rotation flow.

There are inadequate health facilities. (Field Survey 2014).

1.2.6.5 Transport and Communication

Communication network are well established, the community have access network from TTCL, VODACOM, TIGO and AIRTEL. Transport and transportation of goods and services it is no longer the problem, there is well tarmac Kilimanjaro to Arusha road and feeder roads are well rough roads. This enables workers, traders and other community members to have smooth movements and accomplish their daily routines. (Field Survey 2014).

1.2.6.6 Health Services

Health facilities in Maji yaChai are well provided. There is Ngongongare health center, Maji ya Chai health center, Tengeru District hospital both are government

efforts in providing health facilities in community. There are various private health institutions like Nkoaranga Lutheran Hospital, University of Arusha medical center and local private dispensaries and clinic catering health services. The infrastructure makes easy access of these services. (Field Survey 2014).

1.2.6.7 Security

Usa river police station provide 24hrs security to the Maji ya Chai. Community members also form community security system known as *Polisi Jamii* or *Sungusungu* in which members conduct night patrols in schedule. The presence of Maji ya Chai primary court, elder's council as well as land council provide a stability community by handling various matters arises among the community.

1.3 Community Needs Assessment

The aim of Community needs assessment is to identify the assets of the community and determine potential concern that it faces. A straightforward way to estimate the needs of a community is to simply ask residents their opinion about development of services within the community, their satisfaction with services, and what particular services are needed. Their opinions can be used in building agenda aimed at community change….. and development. (Aparna et al 2000)

Community needs assessment was conducted in Maji ya Chai village so as to examine the level of community development, to identify and assess needs and gaps in relation to the available human resources, natural resources, and financial resources, physical as well as social capital resources. The assessment was done in a

participatory way with Ward Executive Officers (WOE), Villages Executive Officers (VEO), community members and other stakeholders so as to meet the desirable project objectives. Various research tools were applied so as to get relevant data and identify the precisely needs and available resources and opportunities available in the community.

The assessment gave way forward on planning various strategies and implementation so as to bring desirable development in the community. The research findings will not only benefit the Maji ya Chai local Government but also the researcher, surrounding community, policy and decision makers and other interested stakeholders who are partners in development.

1.3.1 Research Objective

1.3.1.1 Overall Objective

The overall objective of the study is to assess Janja Improved stove for sustainable economic development: Maji ya Chai community women training in Meru District.

1.3.1.2 Specific Objectives

i) To identify various source of energy used in the study area.

ii) To create awareness to the Community on Renewable energy

iii) To analyze cost variation of different source of energy used in the study area.

iv) Capacity building to Women groups and community on Janja stove.

v) v. To examine viability of Janja stoves project in the community.

vi) To analyze cost effectiveness of Janja stoves in the community.

1.3.2 Research Questions

i) What are the sources of energy used in Maji ya Chai village?

ii) What is the cost variation of different source of energy used in Maji ya Chai village?

iii) What is the viability of Janja stove project in Maji ya Chai village?

iv) . Is Janja stove cost effective in Maji ya Chai village?

1.3.3 Research Methodology

1.3.3.1 Research Design

According to Selltiz *et al,* (1962), a research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. In this study a cross-sectional research design was used by which data were collected at point in time in the study area using baseline survey to obtain primary data which was conducted at Maji ya Chai ward from November 2013 to February 2014.

Olsen *et al,* argue on cross-sectional study design that…in this type of research study, either the entire population or a subset thereof is selected, and from these individuals, data are collected to help answer research questions of interest. It is called cross-sectional because the information about X and Y that is gathered represents what is going on at only one point in time.

The targeted research population was 29,313 (14,143 males and 15,170 females) in Maji ya Chai Ward. 100 respondents were selected as a sample to represent the entire

population. Seventy respondents from Maji ya Chai ward in four villages responded to the questionnaires these include Maji ya Chai village, Ngurdoto village, Imbaseni village and Ngongongare village. This provides raw facts intended by the study. Also the study involves 117 other stakeholders in focus group discussion (FGD), key informants and interview whereby project groups were formed for project implementation.

1.3.3.2 Sampling Technique

Since the population was finite, the researcher selected samples from the community of different individuals; women, civil servants, pastoralist, and farmers. As the community is indigenous simple random sampling and convenient sampling technique used so as to have selection of sample with no bias and have inclusive collection of ideas in the community. From the study hundred (100) respondents were selected in responding to the questionnaires among the hundred only seventy (70) respondents responded the questionnaires. Also the study involved one hundred and seventeen (117) other community members in a community training in four formed groups.

Probability sampling is also known as ‘random sampling’ or ‘chance sampling’. Under this sampling design, every item of the universe has an equal chance of inclusion in the sample (Kothari 2004). In probability sampling the study use Simple Random Sampling (SRS). Apart from probability sampling technique also the study used non-probability sampling technique whereby convenient sampling technique was used. Convenience sampling involves drawing samples that are both easily

accessible and willing to participate in a study. Two types of convenience samples are captive samples and volunteer samples Teddie et al (2007).

1.3.3.3 Data Collection Methods

Different methods of data collection were employed to acquire various information and data. Both primary and secondary data was collected from respondents through different data collection tools. Primary data was collected by using interview, questionnaire, focus group discussion and observation. Secondary data collected from various key informants like Ward office, District Planning office, community development department, village office, journals and other publication concern energy such as Maji ya Chai community profile, together with National Renewable Energy Technology published by different Authors like Gwang'ombe (2004).

1.3.3.3.1 Questionnaires

Structured questionnaires are those questionnaires in which there are definite, concrete and pre-determined questions. The questions are presented with exactly the same wording and in the same order to all respondents. Resort is taken to this sort of standardization to ensure that all respondents reply to the same set of questions. The form of the question may be either closed (i.e., of the type 'yes' or 'no') or open (i.e., inviting free response) (Kothari 2004).

Structured question were distributed to the respondents who had ability of reading and writing, assistance were provided to three of respondents with either no vision, reading or writing ability by fellow respondent. Open and close ended questionnaires

were composed so as to give respondents a wide range of giving out their opinions and ideas. Additional sheets for extra information were provided if any information was needed. The questionnaires helped to accumulate various data like age, sex, level of income, type of energy consumed, impact derived from consumed energy, suggestions and recommendation on energy application. Also it was useful in determine the persist knowledge of renewable energy in the community.

1.3.3.3.2 Interviews

Kothari 2004 claims that, the interview method of collecting data involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. This method can be used through personal interviews and, if possible, through telephone interviews.

Face to face interview with government and village officials and other stake holders was conducted by the researcher in acquiring primary data. Village local leaders, community members and beneficiary have been interviewed on mutual success of the project. The Village Executive officers include Mr. Kaaya, Mbise and others provide credential information concerning the community in different areas of development.

1.3.3.3.3 Focus Group Discussion

Focus group discussion also used as a tool for primary data collection. The researcher with other stakeholders and beneficiaries had a group discussion on community need assessment. Structured questionnaires were used during this course whereby the questions were based on Energy uses and their impact. The researcher

had a discussion on assessment of community perception on renewable energy in relation to conserving environment, saving cost and health. Prioritization of needs done so as to come up with an inclusive idea on community project. Through participatory rural appraisal the community will be aware of the project and enhance cooperation.

Figure 1.1: Focus Group Discussion

Source: Study Findings, (2014)

Figure above shows CED students, CBO members and other RE stakeholders during focus group discussion in Ngongongare village.

1.3.3.3.4 Observation

The researcher observed various types of energy used by the respondents which represent the entire community. The observation was also done on impact derived from prolonged dependence of firewood on environment. Health concern was also observed by the researcher in relation to the energy source used by the respondent.

Figure: 1.2: Charcoal Stove

Source: Study Findings, (2014)

Figure: 1.3: Three Stone Stove

Source: Study Findings, (2014)

Figure:1.4: Harvestedfirewood

Source: Study Findings, (2014)

Figure 2 above, is observed common source of cooking fuel used to the entire community, most of community members depend on firewood and charcoal for daily consumption. Three stone stove as shown in the figure above is mostly used by the community members.

1.3.3.4 Data Analysis Methods

Data analysis was done using Statistical Package for Social Sciences (SPSS) software version 16.0 by which descriptive statistics such as mean, percentages and frequency were computed to and explained in detail for each objective of the study.

1.4 Community Needs Assessment Findings

Community needs assessment findings done by the researcher in Maji ya chai village are stipulated below based on method and type of data collected. Through the questionnaire the researcher managed to get various information on personal particulars and general views on various issues regarding economic development. The researcher also used focus group discussion with various stakeholders so as to capture addition data and information concerning the community in regard to the subject.

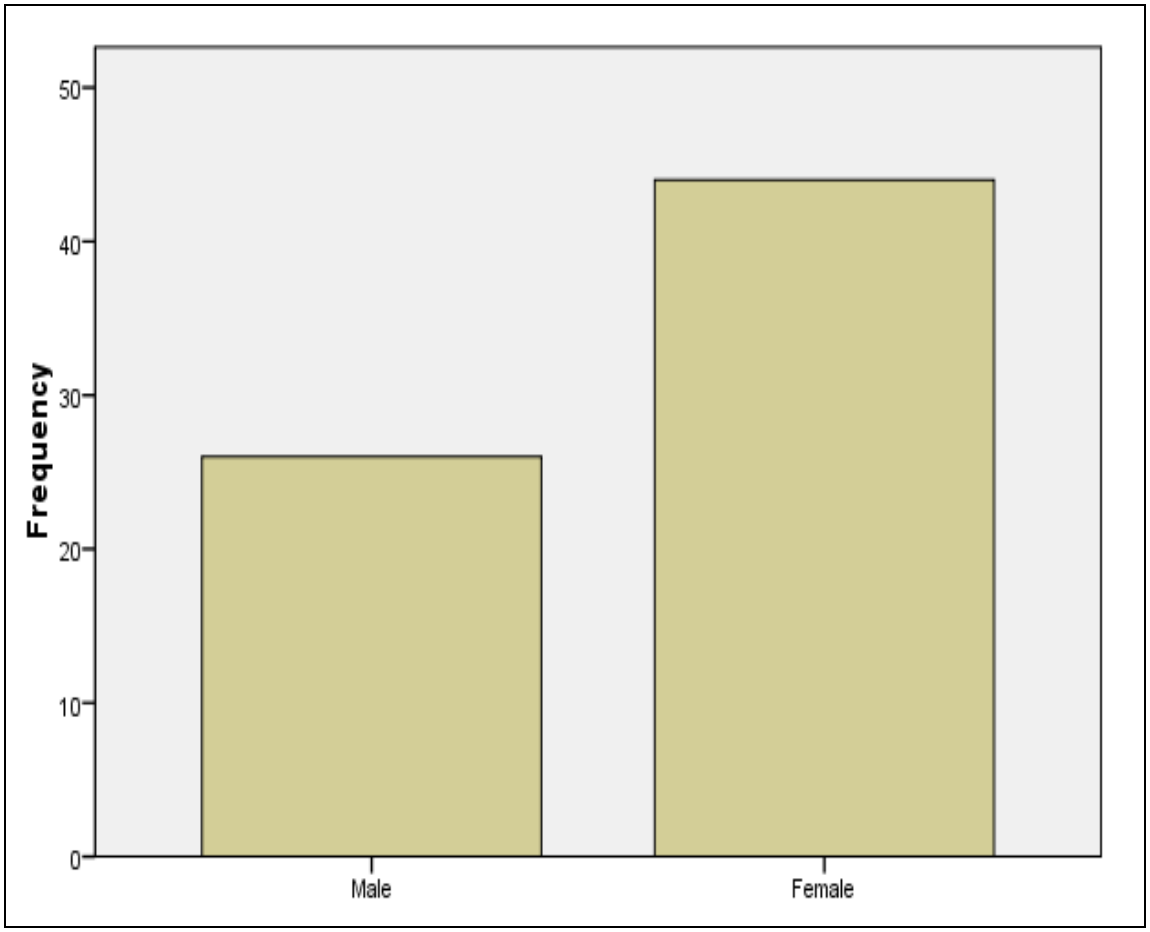

Figure 1.5: Sex of Respondents

Source: Field Survey (2014)

1.4.1 Findings on Personal Particulars

From the study 26 males(37.1%) of total respondents and 44(62.9%) were females respondents. The researcher selects both sex so as to have general views and idea based on the subject. This implies that according to the Culture of the Study Area female are the one who are mostly involved in preparing the food so the issue of source of energy is concerning with them directly different to male. This results are in agreement with other study that was done by Cecelski (2000) in the issue of Role of women in Sustainable Energy Development by which she pointed out that Women are already playing diverse roles in some renewable energy activities:

As energy consumers and beneficiaries, women have contributed to design of household energy technologies and projects.. Therefore it is clearly indicated that Janja stove could be dedicated mostly to women in the study area as they will be easily to adopt it as compared to men in the study area because women are the one who are mostly prepares and using the energy.

The following chart show the age of respondents in which all respondents were working population, respondents aged between 18-30 were 34(48.6%), 31-40 were19(27.1%), 41-50, 9(12.9%), 51-60, 6(8.6%) and 61-80, 2(2.9%). Since the respondents are matured community members (18 and above) who participates in various community economic development projects and energy is one of the concern for their economic sustainability provide effective room for their participation in the study. The table below stipulates age of respondent in the community. A total number of seventy respondents answer given questionnaires.

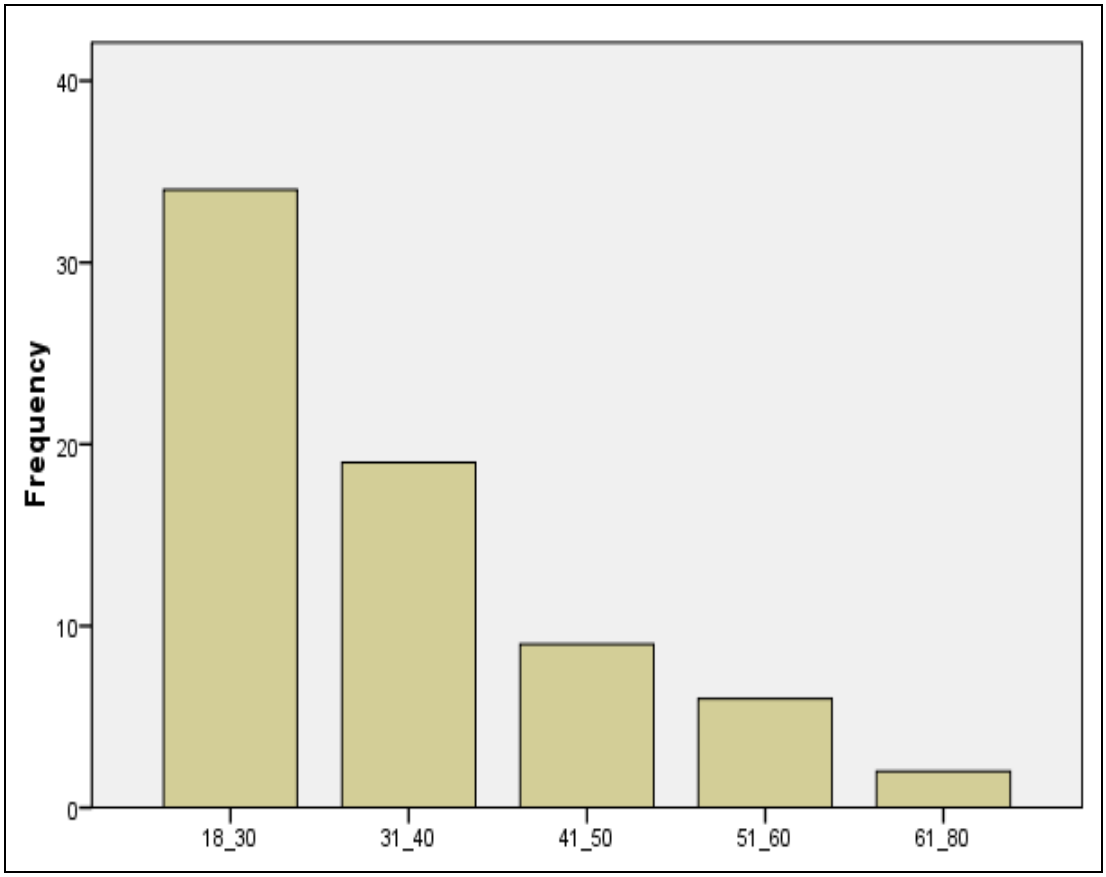

Figure 1.6: Age of Respondents

Source: Field Survey (2014)

Chart 3 below show the level of education of the respondents, 41(58%) were Primary School leavers, 9(9%) Secondary School and 20(28.6%) attended College and University education. The determined levels of education enable the trainers and facilitator in setting up the strategies for training for positive impact. Few respondents 20(28.6%) who reached College and University level of education adopted various sources of Renewable energy like Bio gas and Solar power. The level of education here proves the illiteracy on Renewable energy. Through this Renewable source of energy training is very important tool for community development.

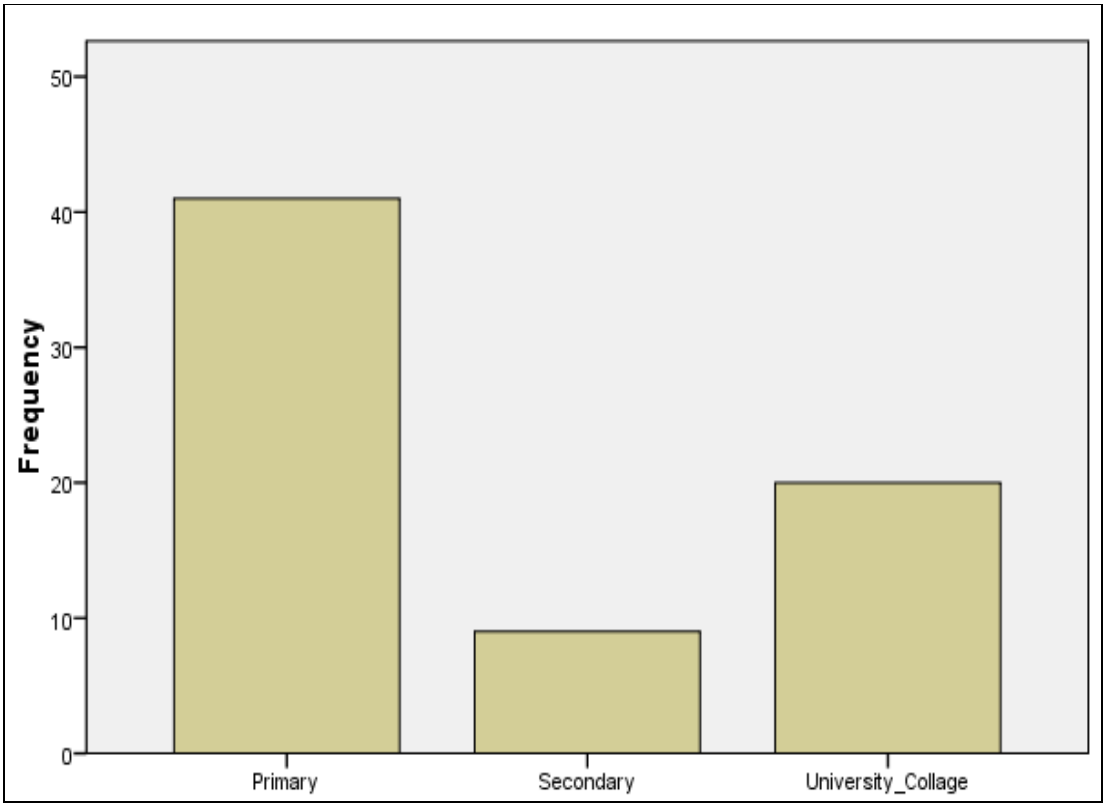

Figure 1.7: Level of Education of Respondents

Source: Field Survey (2014)

The table above shows the education level of respondents, this was important that the study could compare between educational level and energy sources used. Chart 4 below show major occupation of the respondents. 19(27.1%) of the respondents were farmers, 39(55.7%) were employed in government and private sectors, E.g. teachers, clinical officers, nurses, 6(8.6%) were traders, 5(5%) were respondents who practice Farming and livestock keeping and 1(1.4%) were Retiree. The huge number of population 55.7% were employed in government and private sectors and other participate in various economic activities, this provide the fact that the Janja Stove project will be of economic sustainable in the community. The community members will be able to maintain the daily maintenance cost of Janja improved stove.

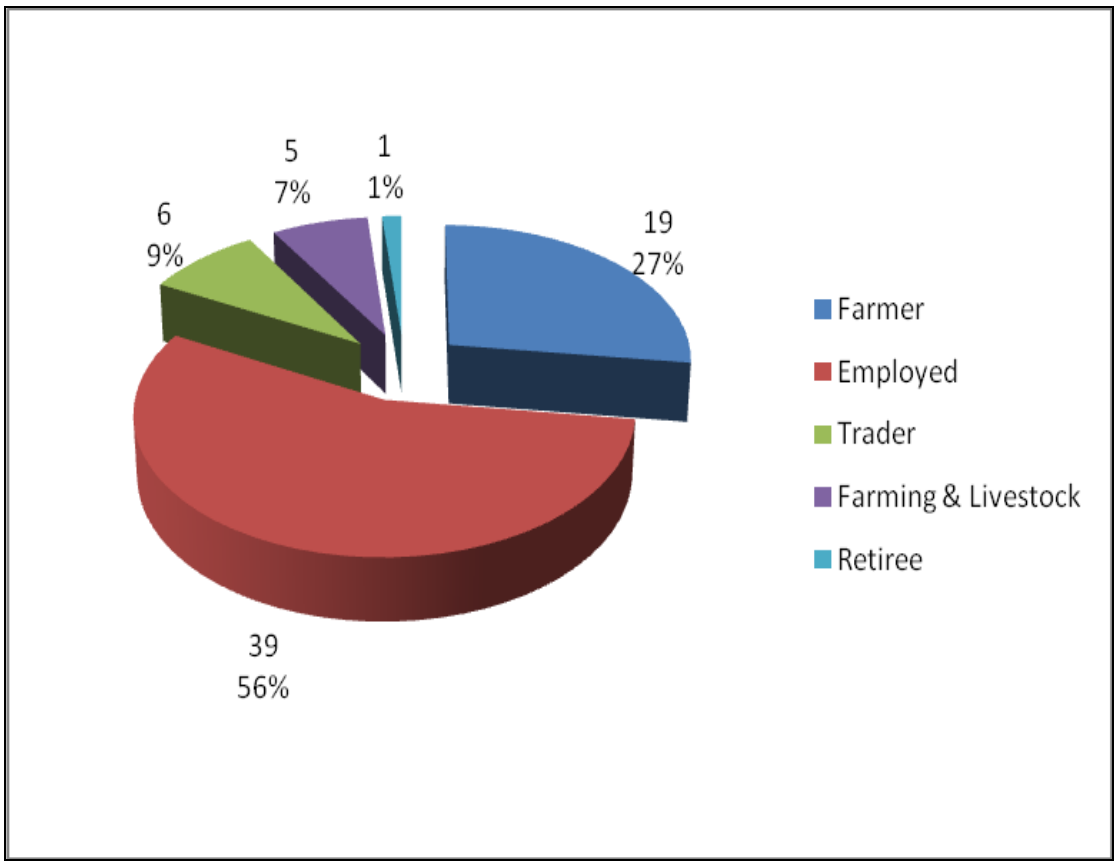

Figure 1.8: Major Occupation Of Respondents

Source: Field Survey (2014)

The Chart above stipulates major occupation of Maji ya Chai community members. Occupation determines family income as well as energy use option.

Table five below stipulate family income of the respondents. A big number of the respondents (42.9%) earn between 110,000 to 300,000Tsh monthly, followed by 41.4% of respondents earn between 0 to 100,000Tsh monthly, the highest earning respondents were only 2.9% earning between 710,000 to 1,000,000Tsh monthly. Income determines energy consumption in household, low income earning family can't afford expensive energy like gas stove rather they depend on firewood.

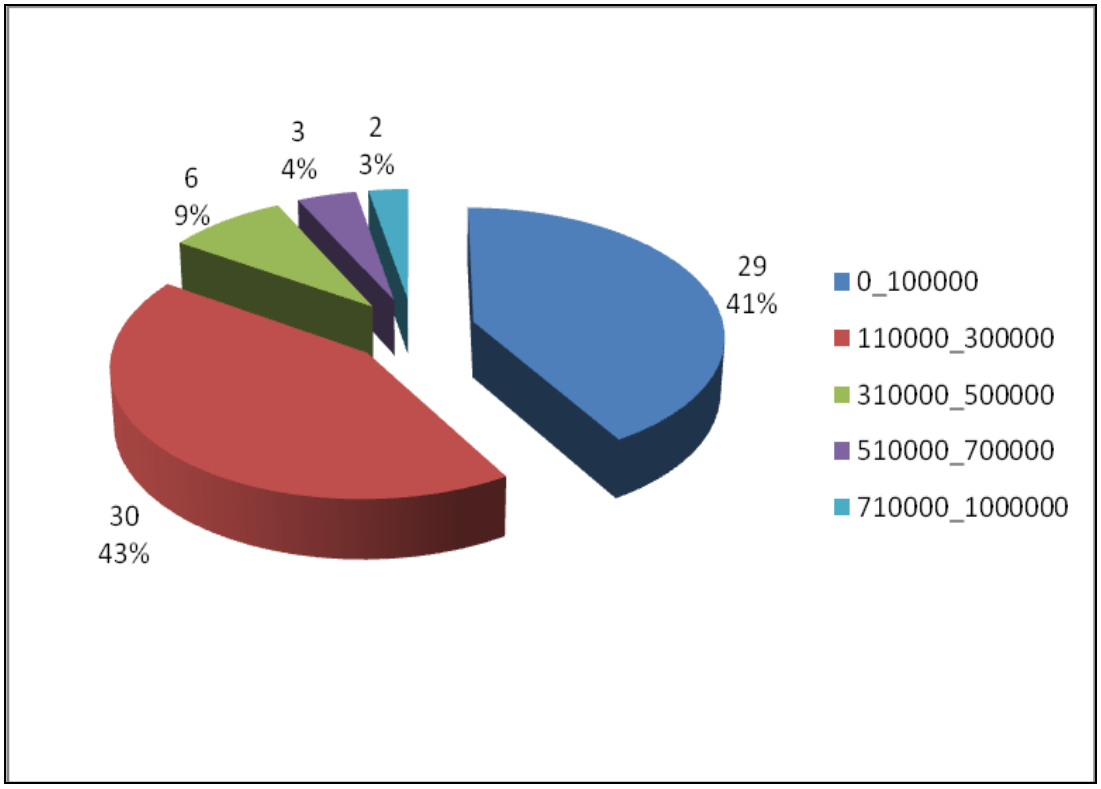

Figure 1.9: Family Incomes of The Respondents

Source: Field Survey (2014)

Family income was one of the study area which the researcher dealt with. Income level goes perpendicular with energy consumption. Majority of the respondents had an income of less than Tsh 300,000 per month. Low incomes earners tend to use free or cheap source of energy mostly are firewood and charcoal

Tables 6 below show marital status of the respondents, majority of the sample (71.4%) are married, followed by 15.7% of the sample who are single and 11.4% of respondents who are widowed and 1.4% divorced. The marital status helps in determining energy consumption as in relation to single and married respondents and size of family.

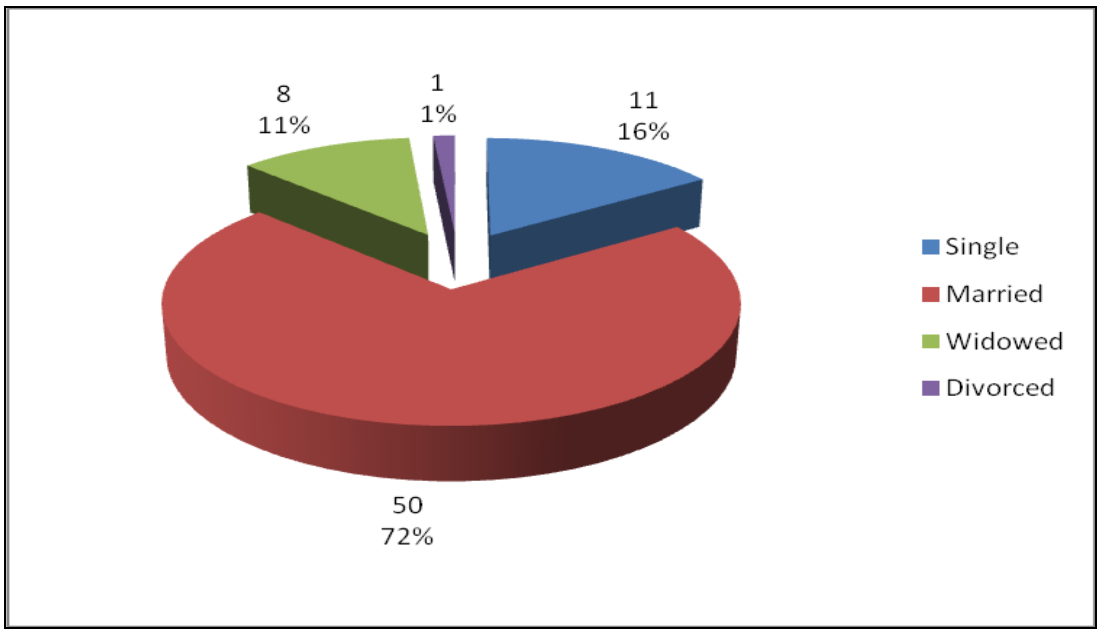

Figure 1.10: Marital Status of Respondents

Source: Field Survey (2014)

Chart six above shows marital status of respondents. The status determines number of family members and energy option. The 71.4% of respondents married, most of this families use charcoal, fire wood and kerosene.

The study also assess the capability of the respondents to meet adequate food. The big sample 49 (70%) shows the capability of meeting the adequate food, 20(28.6%) of respondents were not able to meeting adequate food and only 1(1.4%) of respondent meet food very adequate. From the result a big sample of 70% shows that the community is capable of meeting the adequate food. Cooking energy is one of the essential factor for meeting adequate food. Community has to be training on Renewable Source of Energy so as to enable the remaining 28.6% of the sample which cannot have adequate food to acquire the adequate food.

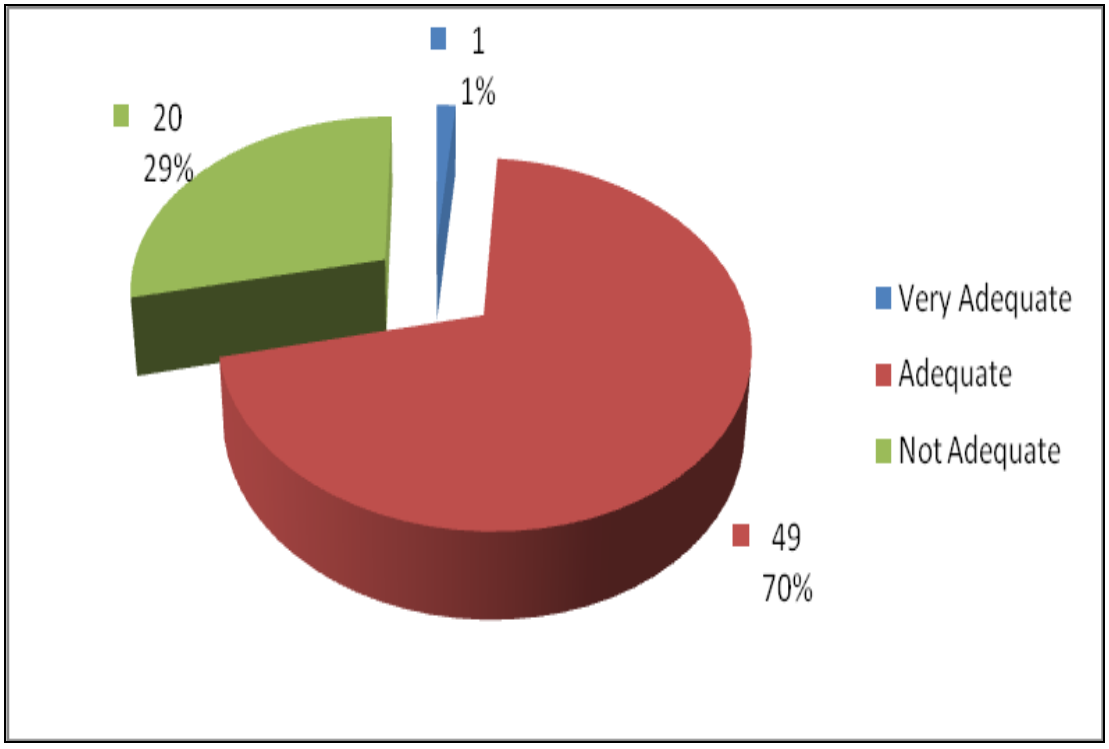

Figure 1.11: Capability of Meeting Adequate Food

Source: Field Survey (2014)

Chart seven above analyzes the capability of meeting adequate food. This assessment determines energy uses in daily life. 70% of respondents are capable of having adequate food; this is to say energy supply should be similar to the demand of cooking energy.

The assessment on capability of building a quality house (Block house roofed with white hard metal sheet) was also done, only 27(38.6%) of the respondents were able to build a quality house and the rest 43(61.4%) were not able to build a quality house. From the sample selected majority (61.4%) claimed that they are not capable of building a quality house, this is due to the low monthly income as stipulated by the study findings above. Renewable energy training will increase monthly income

whereby trained entrepreneurs will use the skills gained for disseminating technology by constructing, installing and operate Janja stove.

This is also supported by the study done by Cecelski (2000) that Women have used renewable energy to increase profits and efficiency in their informal sector enterprises, and have proven themselves capable of operating and also constructing renewable energy technologies on their own, when provided with the appropriate training and support

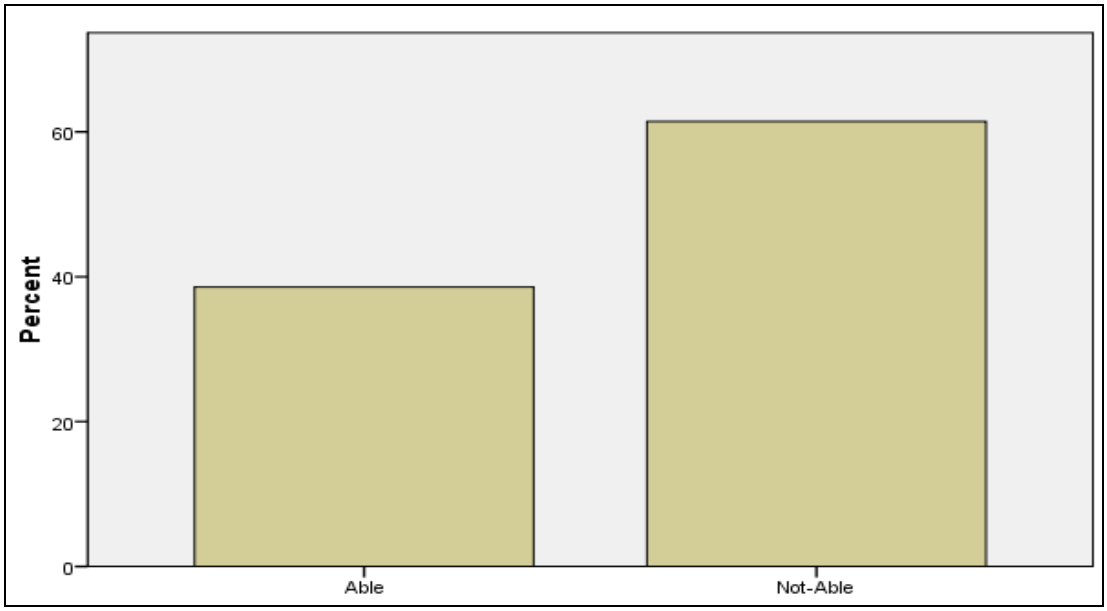

Figure 1.12: Capability of Building a Quality House

Source: Field Survey (2014)

Table 8 above stipulates the capability of respondents in affording quality house as elaborated above. This determines the income level and probability of adopting renewable sources of energy. Capability on accessing better health facilities (Affordability of contributing medication cost in private and public hospitals) also

was assessed in Maji ya Chai village, 38.6% of respondents claimed of not having capability of accessing better health facilities and 61.4% of respondent have capability of accessing adequate health facilities. The result shows that the community has no financial savings. As long as Janja Stove Renewable source of energy intended in Economic development, the community will generate some income which it will enable them to afford better medication provided in public and private hospitals.

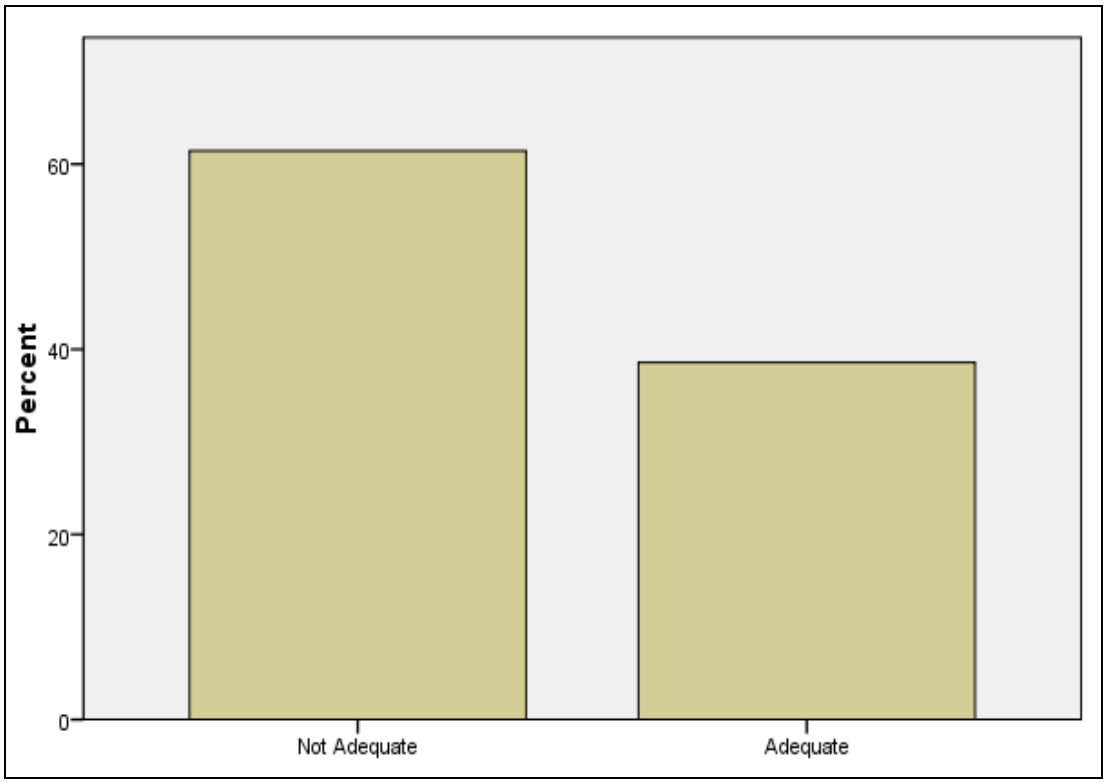

Figure 1.13: Capability of Accessing Better Health Facilities

Source: Field Survey (2014)

Table 9 above examined the capability of accessing health facilities. 61.4% of respondents can access health facilities. This also paves the way for examining project sustainability to the community.

1.3.1 Findings on Economic Assessment on Energy Used

Economic assessment on energy use was also done, the assessment was intentionally conducted so as to measure the level on income, cost and sustainability of energy used. The researcher made a survey on community awareness on renewable energy. 52.9% were aware of the concept of renewable energy and 21.4% were not sure, 25% of the samples were completely unaware. This finding project community level of understand on the concept of renewable energy. Quarter (25%) of the community sample selected is completely unaware of the concept Renewable Energy and 21.4% are not sure. There is a great need of conducting community training of the concept Renewable Energy with emphasize on Janja Stove improved stove so as to raise community awareness on the subject.

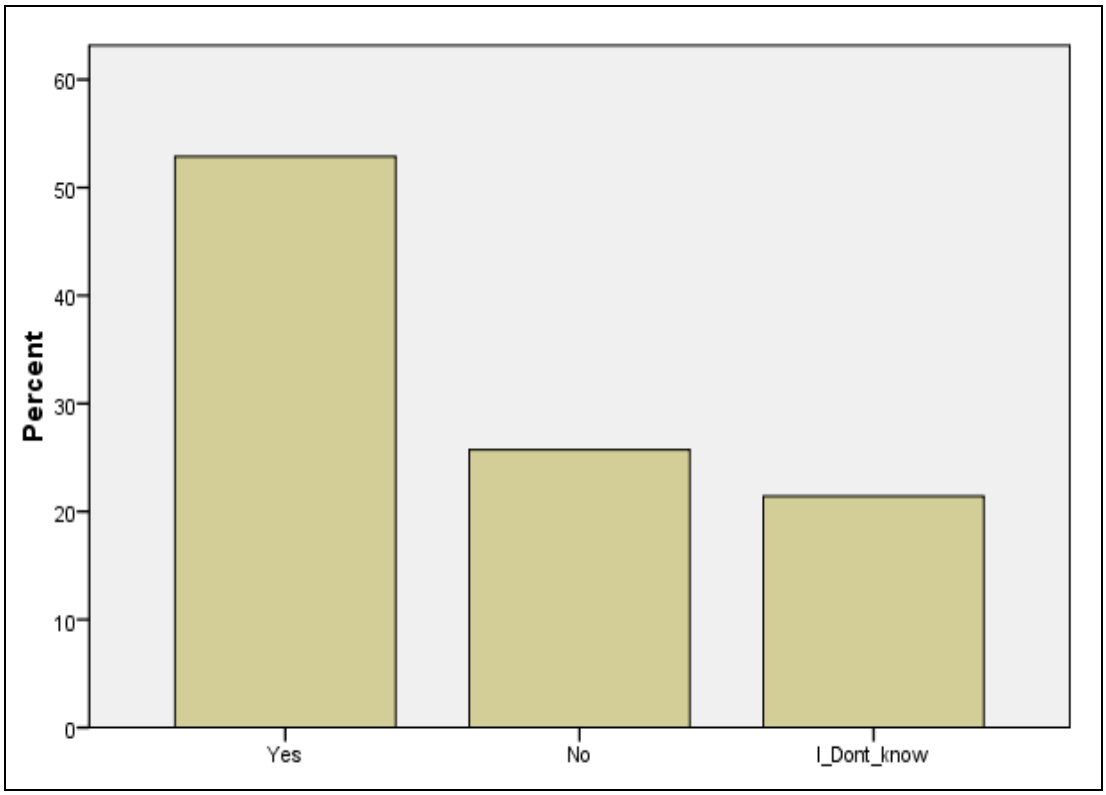

Figure 1.14: Community Renewable Energy Awareness

Source: Field Survey (2014)

Renewable energy awareness in the community was done purposely so as to have a picture of community understanding on renewable energy sources. This gave a roadmap for CBO and other stakeholders in plan and implementation of the project.

Energy affordability under this section was another assessment conducted. A big number of respondents 58(82.9%) were not able to afford the non renewable energy cost in daily maintenance and throughout the month. 11(15.7%) were able to afford the cost and 1(1.4%) were sometimes able to afford the expenses. Since Renewable Source of Energy minimizes the cost of maintenance the 82.9% of the population have to adopt Renewable Energy Sources so that they could afford energy cost. With renewable energy all member of the community will be able to afford, chart two below stipulate this.

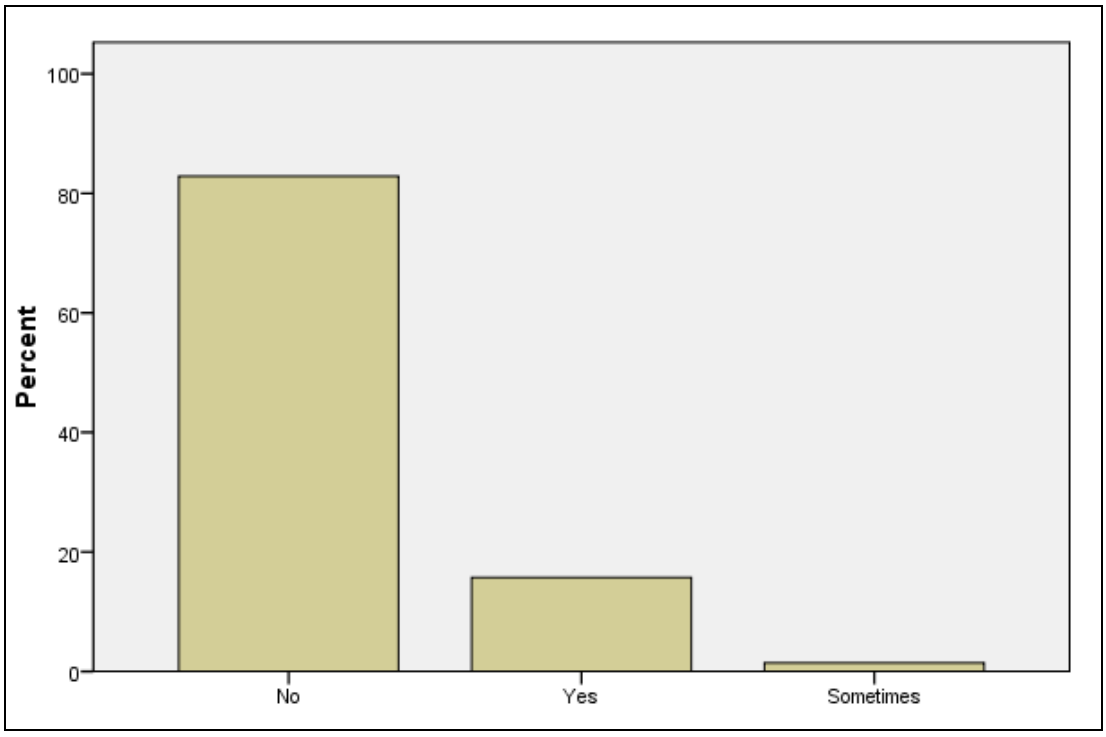

Figure 1.15: Community Renewable Energy Awareness Community Energy Affordability

Source: Field Survey (2014)

Chart 11 above shows energy affordability by community members. This was key point in assessing the sustainability of the renewable energy source (Janja stove). Most of energy used by majority is non-renewable resources. With the introduction of renewable energy community at large could afford.

The question of sustainability starts with daily maintenance cost. Daily maintenance cost was assessed, a big sample (71.4%) shows that they consume 500-1000Tsh for energy especially fire wood daily. Renewable energy could reduce the daily maintenance cost of the energy and enabling community member to serve/invest financial and time resources on other areas. 25.7% use 1100-2000 on daily maintenance basis of energy.

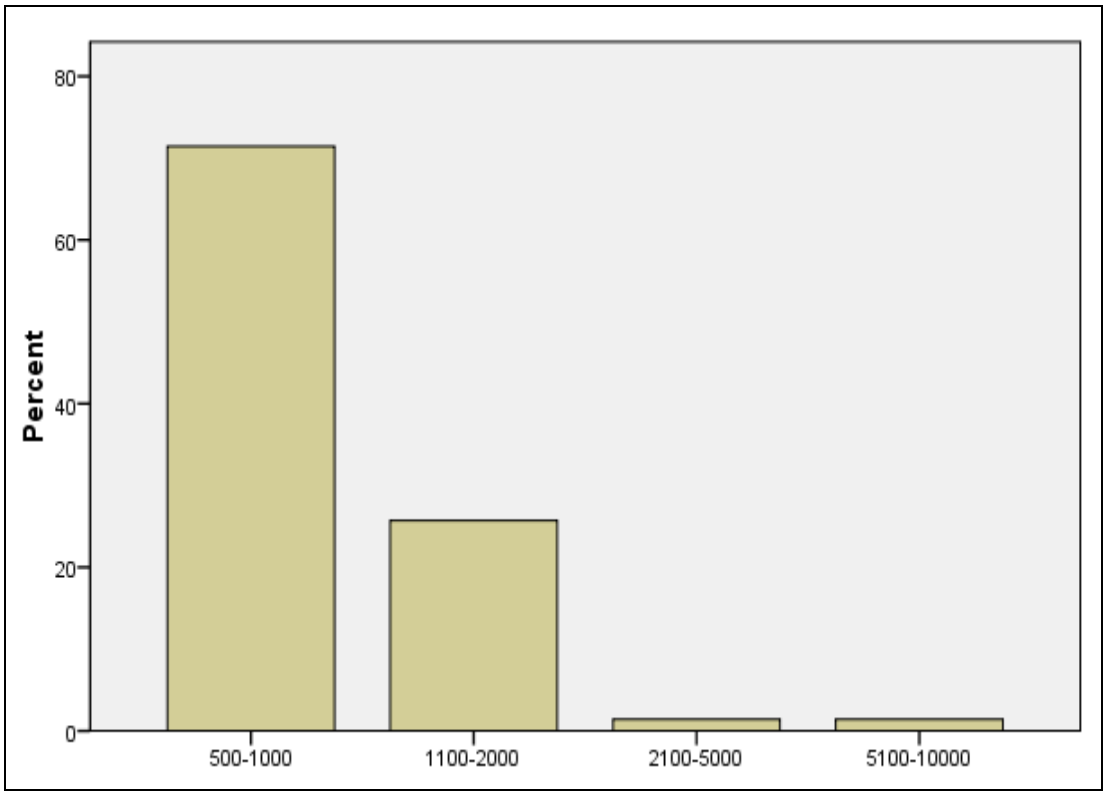

Figure 1.16: Daily Maintenance Cost Assessment

Source: Field Survey (2014)

Daily maintenance cost of energy used also was involved in the study as stipulated in chart 12 above. This will help the researcher in making comparisons between maintenance cost of renewable energy and non-renewable sources so as to determine cost benefit.

Monthly cost survey was conducted so as to assess total consumption of finance on energy. 44.3% of sample spend 30,000 to 45,000Tsh on buying energy especially firewood, charcoal and kerosene monthly. 20% of chosen sample use 51,000 to 60,000Tsh to buy energy especially gas stove, electricity (H.E.P) only few can afford to consume high amount of money in buying these expensive sources of energy.

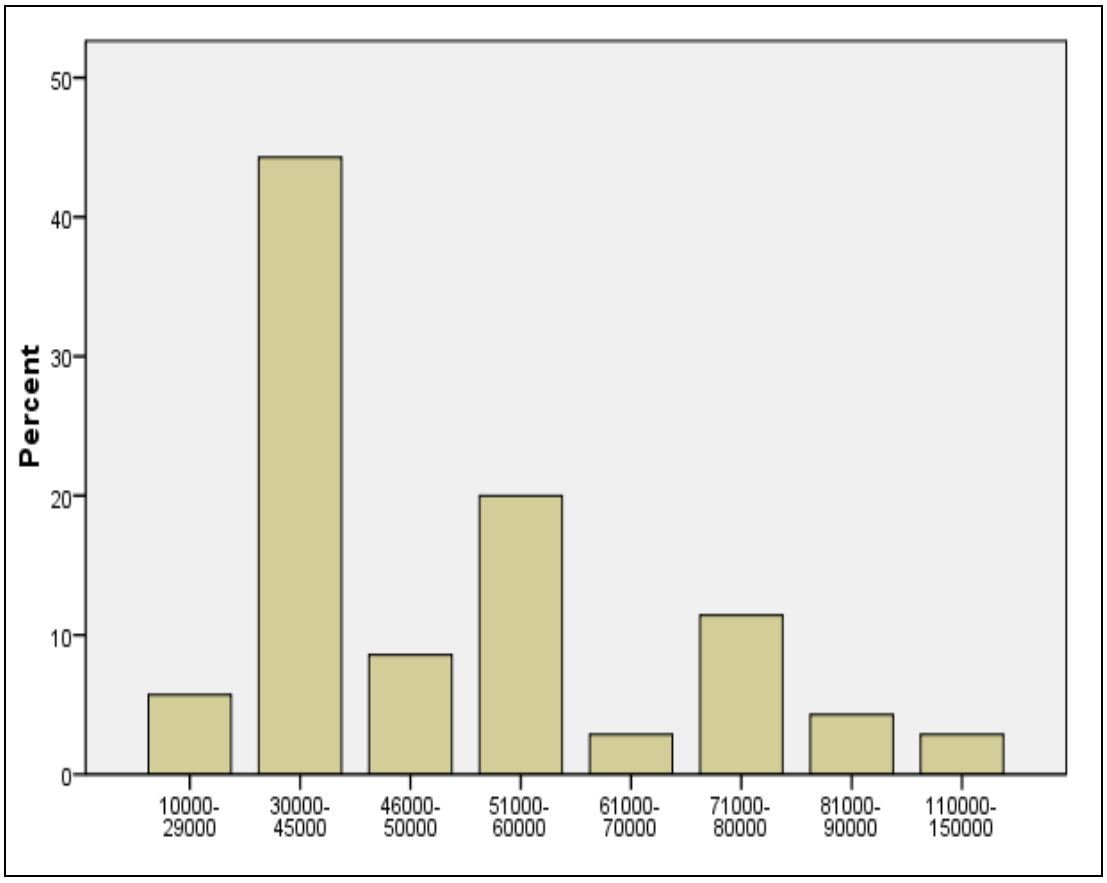

Figure 1.17: Monthly Cost of Energy

Source: Field Survey (2014)

Chart 13 above shows monthly cost of consumed energy. This also is important data in predict project sustainability in the community. The result shows a big sample spent 30,000 to 45,000 Tsh in monthly maintenance cost of energy used. RES will save cost in daily consumption and monthly too. The comparison between level of education and type of energy used were made by the researcher. The study showed that primary level of education are mainly use three stone stove type of energy, this is due to low level of income and lack of awareness on renewable source of energy. Secondary level of education are using kerosene and three stone stove form of energy still in this group of people are earning less and having little awareness of renewable source of energy. The third class of people is university and college level of education. The study shows that they use highly gas stove form of energy, this class of people shows awareness on renewable source of energy Chart 14.

Figure 1.18: Level of education in Relation on Energy Used

Source: Field Survey (2014)

Chart 1 above shows relationship between education level age of respondents and energy sources used by respondents. The more educational level the higher modern source of energy adopted; this is because also income level increased perpendicular with education. Primary level of education which are majority of respondents use kerosene and three stone stove.

Time is non-renewable resource that human beings have. The time used to fetch fire wood was examined by the researcher. The study showed that, 28% of women and children who are the main responsible in fetching firewood use 31 to 45minutes approximately three times a week. The study also showed that, 25% of people spend 21 to 30 minutes twice a week in searching firewood and 23% spend 5 to 20minutes daily in searching for firewood. Through this community have low level of development since lot of time is spent in collection of firewood. Children will have little time on studying, playing and rest during a day. With renewable source of energy this problem would be eradicated. The chart below stipulate time used on fetching firewood.

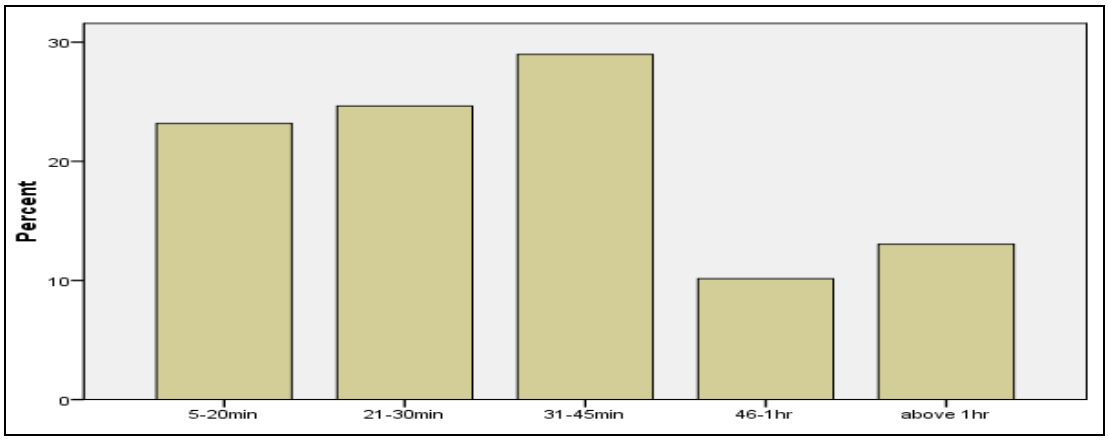

Figure 1.19: Time used to fetch Fire Wood

Source: Field Survey (2014)

The above chart 15, shows time spends in fetching and preparing cooking energy. Most of people especially women and children spend lot of time in a day as stipulated above in preparing cooking energy. Janja stove will save time spent in collecting fire wood and money spent in buying charcoal by using few firewood and charcoal with great energy generated from the stove time and money used in acquiring energy will be reduced.

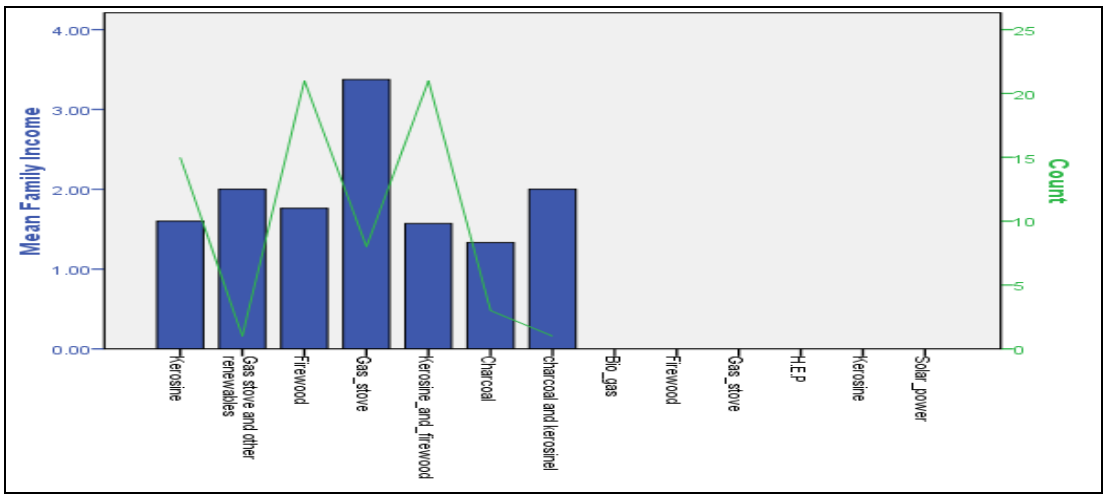

Figure 1.20: Mean Family Income in Relation with Energy Used

Source: Field Survey (2014)

Energy chosen correlate with the income. The assessment on type of energy used was done as a way of determining community economic level in relation to the type of energy used. The result show that; Low income earners mean 1.3333 (3) and 1.5714 (21) and 1.7619 (21) opt charcoal, kerosene and firewood. The highest income earners mean 3.3750 (8) use Gas stove. A big number of sample in the community earning low and tend to opt charcoal, firewood and kerosene as a major source of energy. Over dependence of these sources brought tremendous impact on environment, this have been also supported by Darling (2008) on her study in

Nigeria basing on Energy crisis where she argue that…The energy industry in Nigeria has severe environmental ramifications, mostly in the form of both pollution and deforestation

Findings from Focus Group Discussion

Focus Group Discussion is one of the tools applied in the study so as to acquire some important information so as to enable the study to furnish its objectives. It was found that women are the one who makes choice on energy consumption. 82.9% of population in villages suffering from prolonged uses of firewood. Different cases were reported in here where by Allergic eye Conjunctivitis and respiratory tract infection such as coughing and flue has been a result of indoor air pollution. The uses of non-renewable sources of energy like three stone stove led to economic burden to the community in buying fire wood and charcoal twice or thrice per week for household consumption.

From Ward Executive Officers and Village Executive Officers it was found that 90% of population use fire wood together with other sources of energy like charcoal stove, kerosene stove. The concept of renewable energy particularly Janja stove is still new to the community. Different problems were raised by the WEOs and VEOs these were: lack of electricity supply, poor roads, inadequate health facilities and scramble for land between farmers, pastoralist and private investors.

Findings from Observation

During the course of data collection, different observations were done by the researcher. Different source of energy used by the community were observed. Three

stone stove, charcoal stove were common used by the community. Also indoor air pollution were observed were by most of women and girls perceives allergic eye conjunctivitis.

Charcoal stove and three stone stove.

Figure: 1.21. Modified Firewood Stove

Figure: 1.22. Cement Stove

Figure 1.23: Bio Gas Stove

1.5 Community Needs Prioritization

Table 1.1: Community Needs Prioritization

	Cattle keeping	Telecommunication	Food vendors	Renewable energy	Garbage collectors	Horticulture activi-ties	H.E.P supply	Tarmac roads	RANKING	SCORE
Cattle keeping		Telecommunication	Food vendors	Cattle keeping	Garbage collectors	Food vendors	Cattle keeping	Cattle keeping	4	5
Telecommunication	Garbage collectors		Telecommunication	Renewable energy	Renewable energy	Renewable energy	Horticulture activities	Cattle keeping	2	7
Food vendors	Telecommunication	Food vendors		Food vendors	Food vendors	Food vendors	Horticulture activities	Cattle keeping	5	4
Renewable energy	Renewable energy	Renewable energy	Renewable energy		Renewable energy	Renewable energy	Renewable energy	Renewable energy	8	1
Garbage collectors	H.E.P supply	Telecommunication	Tarmac road	Cattle keeping		Garbage collectors	Renewable energy	Renewable energy	1	8
Horticulture activities	Renewable energy	Horticulture activities	Horticulture activi-ties	Food vendors	Horticulture activities		Horticulture activities	Horticulture activities	6	3
H.E.P supply	H.E.P supply	Horticulture activities	Renewable energy	H.E.P supply	H.E.P supply	H.E.P supply		H.E.P supply	7	2
Tarmac road	Renewable energy	Tarmac road	Renewable energy	Tarmac road	Food vendors	Renewable energy	Renewable energy		3	6

Source: Study Findings, (2014)

1.6 Conclusion

Chapter one illustrated participatory needs assessment as the ideal and effective way of involving community members in discussing and identifying their own problems, causes and existing opportunities towards the problems. The study has been useful in enabling the community members in participating in the study by responding to the questionnaires, focus group discussion by identifying and ranking problems, and during entire project implementation. Also it helped in formulating strategic ways for problem mitigation**.**

The participatory needs assessment conducted in Maji ya Chai village revealed that, energy is the major concern impacting most the entire community. From this study community members came into agreement that renewable energy will improve socio-economic status. As they responded in focus group discussion, questionnaires, interviews, and general observation, non-renewable energy brought a big burden of living cost and came into common say that renewable energy will be a tool for development. Through the community needs assessment, the researcher wants to make sure that community members' expectations are met.

CHAPTER TWO

2.0 PROBLEM IDENTIFICATION

2.1 Background to Research Problem

This chapter discusses needs identified from Community Needs Assessment. It consists of the essential social and economic data for the district as well as the problem statement. The social and economic data for the district is the results of the community assessment done by the researcher in chapter one. Most of the sample earn little income this brings difficultness in acquiring basic standard of life. Low income contributed by low level of education attained by the sample, 58.6% end on primary level of education, only 12.9% succeeded to attain secondary education and only 28.6 were able to join university and college education. (Refer to Chapter 1, Chart 3).

The study aimed at alleviating cost of living by introducing and campaigning for renewable energy in the community so as people could save more financial resources as well as preserving environment, this could help the community to invest more resources on other aspect of community development like nutrition improvement, quality housing construction, accessing better health facilities as well as avoiding health effects derived from smoke emitted from firewood. (See prioritization 1.4). There are numerous number of problems that affecting Arusha and Manyara Regions as follows:

Women socio-economic oppression, Civic and voter illiterate, poor knowledge on Renewable sources of energy, Girl child oppression, Land conflicts among

pastoralist and farmers, poor knowledge on organic food processing and marketing, lack of social accountability. These problems have been affecting women and entire community. Also from the study other problems were identified such as poor infrastructure and lack of established market. Both of these problems have been discussed hereunder.

Time is one of nonrenewable resource that a human being have. As it was found in the study that 28% of women and children who are the main responsible in fetching firewood use 31 to 45 minutes approximately three times a week in fetching a firewood, 25% spend 21 to 30 minutes and 23% of women and children spend 5 to 20 minutes in searching firewood. (Refer to Chapter 1, Chart 15.). Time spend by women in searching for firewood hinder them from participating in other economic activities.

As children also responsible in fetching firewood, some of their rights have been stolen e.g. right to play and rest. According to Tanzanian law of the Child Act No. 21(2009) Section 8, subsection 1g states that 'It shall be the duty of a parent, guardian or any other person having custody of a child to maintain that child in particular that duty gives the child the right to - (a) food; (b) shelter; (c) clothing; (d) medical care including immunization; (e) education and guidance; (f) liberty; and (g) right to play and leisure''.

Energy is the main persistence need in Maji ya Chai ward, only 52.9% of sample knows about renewable energy, 25.7% of the sample have very little idea and 21.4%

they don’t know completely about renewable energy. Energy is one of the daily countable cost in human life, 82% of population are not affording monthly and annually cost of energy. Increased cost of life pave difficultness on accessing other basic social services like; better health facilities, quality housing and adequate food. (Refer to Chapter 1, Chart 10). By introducing Janja Stove improved source of energy community will save financial resources from massive consumption of non-renewable sources of energy for sustainable economic development.

Food is basic needs of the human beings. Food vendors claim for big and secure market into which they could be able to sell their products without any interference from local authority concern areas of selling their produces. The market size is small compared to the number food vendors in the market. Meru people are the good cattle keepers, for a many decades in Arusha region are the main milk producers and suppliers in the city. Changing in weather condition it has become a great challenge to the cattle keepers. Packaging and transporting also is the challenge to the milk vendors. They use gallons and bicycle in distributing milk, having nylons mechanized parking and well form of distributing is one of their desires.

Infrastructure is another problem persists in Maji ya Chai village. Transport and communication problem persist in many Tanzanian areas, the government initiated some long term measures on this problem. The last but least problem was garbage collectors, Maji ya Chai is one of the areas in the Arusha city where its’ population grows up day after day, the increasing population needs also increased infrastructure. Waste disposal is coming up problem whereby there is no formal way of disposing

the waste. Renewable sources of energy will play a vital role in propelling infrastructure development by assuring environmental protection (Soil erosion) and stimulate infrastructure investment in the particular area. Also the waste used in making renewable energy will reduce the massive pollution resulted by garbage from residential.

Also the study identified various agriculture problems which are: Problem associated with cattle keeping and horticulture activities. Climatic condition is one of the challenges towards the agriculture performance. As over dependence on non-renewable sources of energy results into environmental degradation, in which results into poor agricultural performance, the study aimed at cutting/solve the core problem by introducing renewable source of energy to the community so as to alleviate poverty and protect environment as well as health.

2.2 The problem Statement

Energy is less prioritized problem which brought suffering to most women and children particular in Africa. The use of non-renewable energy brought poverty since people incur lot of expenses in buying non-renewable energy. Health problem is one of the effect associated by indoor air pollution. Women suffers from respiratory infection from smoke, also tend to have eye allergic from smoke produced from combustion. The prolonged use of non-renewable sources of energy and overdependence of firewood and charcoal brought many environmental impacts like soil erosion, increase of global temperature, decline of rainfall and disappearance of natural species.

The World Health Organization (WHO) has taken a novel approach to combating two key health issues in Africa: the effects of indoor pollution and unsafe drinking water. The pilot was undertaken in Cameroon and Kenya and involved the promotion of the use of improved stoves with water treatment practices in an integrated household intervention. The study aimed at widening up the spectrum of renewable energy in Maji ya Chai village, with great emphasis on sustainable economic development.

2.3 Project Description

The project is known as Janja Improved Stove for Sustainable Economic Development: Maji Ya Chai Community Women Training. The project is located in in Maji ya Chai ward in four villages namely; Maji ya Chai, Imbaseni, Ngongongare, and Kitefu in Meru district in Arusha city. The project aimed at providing community train on renewable sources of energy together with skills on making and using Janja Improved stove for sustainable economic development. After attending the training, the beneficiaries will participate in building of janja stove in various institutions like Hospitals, schools as a practice. After the participants acquire knowledge will become Trainer of Trainees (ToT) by become the active members in community. The trained groups will be the source of change by spread the technology to the entire community. The project will be a source of socio-economic development to the community by reducing running cost of cooking energy, improving kitchen hygiene as well as avoiding health problems resulted from massive emitted smoke. The project will be implemented by Women Development for Science and Technology the Community Based Organization centered in Njiro

Agricultural showground and Maji ya Chai ward by formed groups. After the Maji ya Chai beneficiaries (Mitiasili group, Ikia group, Imbata group and Tiirashike group) attended the training from November 2013 to January 2014, agreed to prepare themselves and execute the project from March 2014. Arusha Technical College (ATC) and Center for Agriculture Mechanization and Rural Development (CARMATEC) being the stakeholder promised to support the CBO with tools/equipment required for success of the project

2.3.1 Target Community

Maji ya Chai villagers are the main targeted community whereby they are expected to acquire training and participating in project implementation. The project will take place in Maji ya Chai ward in four villages namely; Maji ya Chai, Imbaseni, Ngongongare, and Kitefu in Meru district in Arusha city. After attending the training, the beneficiaries will participate in building of janja stove in various institutions like Hospitals, schools as a practice. After the participants acquire knowledge will become Trainer of Trainees (ToT) by become the active members in community. The trained groups will be the source of change by spread the technology to the entire community. The project will be a source of socio-economic development to the community by reducing running cost of cooking energy, improving kitchen hygiene as well as avoiding health problems resulted from massive emitted smoke.

2.3.2 takeholders

The identified stakeholders in this project are; Community Based Organization (CBO), Maji ya Chai Community members (Mitiasili group, Ikia group, Tiirashike

group, Imbata group), Village executive officers, Arusha Technical College (ATC), Center for Agriculture Mechanization and Rural Development (CARMATEC) and Tree organization. This team will contribute in one way or another for the success of the project as analyzed on table No.12.

Table 2.1: Roles and Expectations Of Various Stakeholders

S/N	Name of the stakeholder	Role of stake holder	Expectations
1	CARMATEC	1.1 Provision of technical support to the CBO'S. 1.2 Capacity building to the CBO in terms of Entrepreneurial operation skills. 1.3 Promotion of improved Janja Stove thoroughly technical support.	-The sustainability of the project is ensured. Skills for the CBO and community members increased. -Increased district GDP. -Project explicability. -Increased number of technician
2	Maji ya Chai formed groups. (Miti asili group, Ikia group, Tiirashike group, Imbata group)	2.1 Janja stove community ToT 2.2 Promoting Janja Stove technology through skills dissemination	-Reliable market of Janja Stove. - Income generation -Improved standard of living from Janja Stove. -Reducing cutting down of trees
3	Micro finance institutions (NMB & SACCOS)	3.1 To provide soft loans. 3.2 Capacity building to CBO of entrepreneurial skills	- Financial strong CBO -Reliable customers
4	Mass media.	4.1Promotion and publication of Janja Stove technology	-Increasing project awareness -increased number of Janja Stove users
5	Maji ya Chai community	Janja Stove customers	-Saving energy cost - Improve standard of life
6	Community Based Organization	6.1Establishment of energy centre. 6.2 To add Value to the energy product	- Increase income of Janja Stove activist and CBO. -Poverty reduction
7	Maji ya Chai, Ngongongare, Imbaseni and Kitefu Village Executive officers	7.1 Coordinating community members 7.2 Influencing renewable energy use	- increased numbers of renewable energy users -improved standard of life
8	Arusha Technical College	Technical support to the CBO	- Efficiency run of the project

Source: Study Findings, (2014)

2.3.3 Project goals

Energy crisis and poverty is long lasting prevailing situation in Maji ya Chai ward, Majority of the respondents had an income of less than Tsh 300,000 per month Field Survey (2014). Common use of non-renewable energy and over dependency of firewood as source of fuel is one of the factor which lead to deforestation as well as poverty. The project aimed at (i) Poverty reduction, (ii) Preserving environment and (iii) Improve standard of living by income generation derived from entrepreneurs and savings from renewable as well as (iv) Reducing indoor air pollution.

The improved stove (Janja Stove) will reduce the running cost of cooking energy by cutting down used expenses of non-renewable fuel, also the stove will reduce deforestation by lowering firewood uses. Janja Stove installed with chimney which let the smoke out will alleviate indoor respiratory diseases as well as eye conjunctivitis allergic. The renewable energy will reduce poverty since community will be able to save from energy used and provide another opportunity for investing the saved resource.

2.3.4 Project Objectives

The project aimed at identify the contributing factors and community opinions as well as recommendation which would enable decision makers in planning and execute various measures towards the problem. The study aimed too on building capacity to the community members by giving them skills and knowledge in order to be able to extract available resources and opportunities on their own development**.**

2.3.4.1 Overall Objective

The overall objective of the study is to assess Janja Improved stove for sustainable economic development: Maji ya Chai community women training in Meru District.

2.3.4.2 Specific Objectives

i. To identify various source of energy used in the study area.

ii. To create awareness to the Community on Renewable Energy.

iii. To analyze cost variation of different source of energy used in the study area

iv. Capacity building to Community on Janja stove.

v. To examine viability of Janja stoves project in the community

vi. To analyze cost effectiveness of Janja stoves in the community.

2.4 Host Organization

Women Development for Science and Technology Association (WODSTA) is a Non-Governmental Organization based in Arusha, Tanzania. It was started in 1990 and officially registered in 1992. WODSTA's philosophy and activities are focused on enhancing the status and position of women. Emphasis if focused on grass root women, the girl child and the marginalized communities within the Arusha and Manyara region. WODSTA is a women's membership organization guided by the principals of justice, voluntarism and transparency. WODSTA aims at enabling a women's self-discovery with her full potentials.

2.4.1 CBO Leadership

The CBO is having leadership of 5 personnel being a Chairperson, Assistant Chairperson, Secretary, assistant secretary, and the treasurer all of them are woman .

2.4.2 Vision

WODSTA envision a society in which women are empowered, motivated and have equal opportunity with men.

2.4.3 Mission

WODSTA is a non-profit women NGO which works for gender equality, environmental conservation and sustainable livelihoods among women in Tanzania.

2.4.4 Activities

WODSTA's members are drawn from various field including; education health, agriculture, community and gender development, which provide a large pool of knowledge in dealing with complexities of women's development issues. Organization projects and activities vary depending on the demand of members. The emphasis is always focused on the grass roots women and girl children in marginalized communities. The organizations' philosophy of improving the status and position of women through addressing gender, environmental conservation, economic empowerment, lobbying and advocacy and appropriate technology issues is carried out through the following activities;

2.4.4.1 Women Socio-Economic Empowerment

For three years, WODSTA has been addressing poverty reduction through the social and economic empowerment of pastoral women in Northern Tanzania's maasai land. The program ran in three district of Maasai communities; Monduli and Arumeru in the Arusha region and Kiteto in Manyara region. Together with coalition partners,

WODSTA helps small groups of women to join together and establish women's economic groups. These groups have been trained on skills of accounting, product marketing, processing, business management, leadership, cost analysis and group facilitation. In addition sensitization and literacy skills are offered to build their capacities.

2.4.4.2 Civic and Voter Education

WODSTA was among several Civil Society Organization (CSO's) chosen to implement a Civic and Voter Education program in Tanzania during the 2005 election. The target group included young urban women between ages of 18 and 25, illiterate women in rural areas who had limited understanding of their civic and voter rights. The objective of the program were to encourage voters participation in the 2005 election, to develop voter awareness of the democratic process, and improve women's understanding and involvement in the election process. The program closed with culmination of the election while WODSTA was able to reach out over 100% of targeted population.

2.4.4.3 Community Renewable Energy Initiatives

Women Development for Science and Technology puts much of its energy and resources into providing affordable technology and appropriate technology solution to its members and the communities. Women are trained on how to wonder baskets (insulated cooking baskets), energy efficient stoves, double burning stoves and biogas tanks. WODSTA currently work with KIDT to produce compact sawdust briquettes for cooking and heating; a solution to the growing consumption and rising

prices of firewood in Tanzania. Since 2006, WODSTA established two community energy resources centers in Daraja mbili, Sokoni one and Sombetini communities in Arusha Municipality. The BEST RAY Energy Initiative facilitate construction of energy saving stove and open two Community Energy centers at Oldonyosambu and Ngarenanyuki wards, in Arumeru district.

These energy centers are the outlet where community members can visit to learn about energy consumption, appropriate technology and attended workshops on how to build their own energy saving appliance such as wonder baskets, Janja Stoves, solar water heater system, solar dryers and mud stoves while collaborating with others on solution to local energy problems.

2.4.4.4 Girl child Program

The girl child program was an initiative of WODSTA to help educate and improve the self-esteemed of girl children in the Arusha region. WODSTA designed a curriculum to work with local teachers and schools through which it initiated discussion of values, goals and self respect of women in Tanzania society. The girl students were introduced to successful and inspiring role models and received a chance to participate in after school community activities that celebrated women and girls alike.

2.4.4.5 Best ray Project

Activities in Best ray project aimed towards positive attitude change. WODSTA and OIKOS East Africa had worked together to achieve the following;

To enable participants acquire knowledge and skills on how to process and preserve food in proper hygienic environment, to enhance understanding of energy saving technology and alternative fuels for domestic use. To equip beneficiaries with knowledge and skills on business management to be utilized in establishment of small income generating initiatives including food preserved products and energy saving technology. To enhance understanding and create awareness on environmental conservation. To enable participants acquire skills, knowledge and practice on construction of simple solar drier for domestic use in food processing and preservation.

The project has made a big step since its commencement especially women had showed sign of positive attitude change. Women had increased knowledge and skills on business development and management, acquired knowledge and skills on construction and use of solar driers for food preservation, construction of energy saving stoves, and increase awareness and knowledge on environmental conservation.

2.4.4.6 Social Accountability

Women Development for Science and Technology Association (WODSTA) had conducted trainings on social accountability (Public expenditure/social services delivery) to members, partners and coalition/networks of CSOs to influence budget priorities, in order to address the needs of poor women, men, girls, boys and other marginalized groups. It also provide beneficiaries knowledge, skills and techniques for tracking budget inputs, outputs and outcomes; enable them to carry out public

expenditure monitoring in social service delivery and maintained collaboration of coalition and network among partner organization. The program also empowers beneficiaries to access financial information.

2.4.4.7 Pastoralist Empowerment on Land rights and land use in Arumeru District

WODSTA is working with pastoralist women and men on natural resources management. The pastoralist empowerment on land right and land use project had the goal of improving livelihood and land security among pastoralist communities in Arumeru district. The project empowered pastoralist communities on effective implementation of land acts and land rights for sustainable developments initiative. Gender issues in land ownership were addressed during implementation.

2.4.4.8 Food Processing, Marketing and Organic Farming

WODSTA has been at the forefront in the promotion of income generating projects for women. The organization supply educational resources and demonstrate the benefit of organic and bio-intensive (the use of traditional farming practices such as seed transplanting, double dig and multiple crop garden beds and organic composting to produce vegetable without chemical pesticides or fertilizer).

Using these methods, WODSTA work with women's group in the Arumeru district to harvest, process and dry their food products using communally built solar food dryers. Women groups trained on processing mango pickle, tomato sauce, mango chutney, and dried fruits and vegetables. The programs went on giving community

trainings on packing, labeling and marketing techniques as well as train the group members in accounting and record keeping.

2.4.4.9 Promotion of Renewable Energy Sources In Arumeru District

The supply of energy from the state-run network carrier TANESCO is unreliable. A 2011 research in Arusha region found that about 17.5% of the people are connected to the national grid with an average of 13,200 TZS spent on it. In lighting, from 82.5% of people who have no access to the national grid, about 75% use kerosene lamps, 11% use kerosene and oil lamps, and 10% use oil lamps only. Only 3.5% of the asked people are using solar energy. The average money spends on kerosene and oil is about 500 TZS per day.

On cooking, stoves are used in the following order: kerosene, charcoal and three stone fire. On average people spend 11,400 TZS on cooking every week. The mentioned forms of energy have bad impact on the communities because the smoke produced by the lamps and stoves weaken the well of the people and environment. Despite of having many forms of renewable energy such as solar, electric power system, wind energy system, photovoltaic modules, photovoltaic system, solar water pumping systems, solar refrigeration systems, uninterruptible power supply (UPS) and solar home system, but only few of technologies are applicable in rural areas. There is a gap in skills on potentiality of available renewable energy to address the problem of renewable energy with such effects to most population.

2.4.4.10 Pastoral Land Use Conflict Resolution and Advocacy Project

While the formal laws in Tanzania provide equal rights for women with regard to

access to land and secure tenure (through mechanism such as registration of joint rights and marital property laws, access to communal land like grazing land) in many area of Tanzania customary law and traditional practice in pastoral communities prevent these provision from being applied. Lack of knowledge of laws among women, men, local leaders and local authorities present another significant barrier to equal access. Maasia and Meru women in Arumeru villages are more marginalized by culture and tradition. Traditionally, women do not own any resource like land, this make them more marginalized and vulnerable to poverty. This project intends to address issues of land use conflict which constrain the implementation of activities setup by previous programs and ensure sustainability of the past efforts.

2.4.5 CBO Objectives

- To raise awareness about women's role in equitable and sustainable development initiatives, on an international, national, regional and grass root level
- To promote sustainable agricultural knowledge and skills training among individual women and groups to increase women economic empowerment.
- To support women environmental and other income-generating activities that increase women's' economic empowerment. To promote gender-sensitive planning at all levels of society
- To enable women to become aware of their legal and human rights.

2.4.6.1 Status of CBO

Women Development for Science and Technology Association (WODSTA) is a Non-Governmental Organization based in Arusha, Tanzania. It was started in 1990

and officially registered in 1992. It is located in the Northern part of the United Republic of Tanzania in East Africa. Nestled between the highest mountain in Africa, Mount Kilimanjaro and the Serengeti plains, it situated in Arusha inside the Njiro Agricultural Showground.

WODSTA is funded by;

- Membership fees and subscriptions
- Income-generating activities (e.g. secretarial services)
- Donors and partners like Tanzania National Government, UNDP, MIVA, DKA, Austria, European Union (Istituto Oikos), HIVOS, World Bank, Sasakawa Youth leadership Fellowship Fund, Development Planning Unit-London, the Belgium Government and CARE International.
- In kind contribution from non-government partners and individuals.
- International partners: TRIAS TZ, EASUN, DPU-London and HIVOS and Insituto Oikos.

2.4.7 Organization Structure

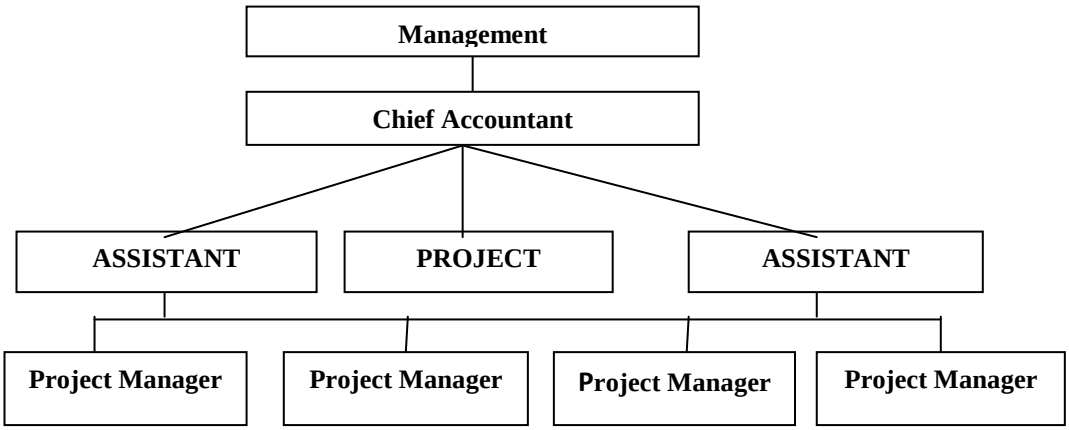

Figure 2.1: WODSTA/ CBO Organization Structure

Table 2.2: WODSTA CBO SWOC Analysis

No	STRENGHT	WEAKNESS	OPPORTUNITY	CHALLENGES
1	Strong and committed leadership	Seven out of ten attended entrepreneurial training	-Members are Trainable -Availability of training centers	-Women are kept busy by house work
2	The group has the status of getting loan from Financial Institution	-	Availability of Financial institutions	-They under utilize the opportunity they have. -The usually invest in small projects
3	Project premises have got high security for group assets	The area is limited in case of expansion	The energy premise is within the village center thus customers are easily found	-The groups are able to establish their own project premises but there is no infrastructure (water& electricity)
4	They have two full time employed staff	Some workers late at work due to Poor transport	Equipped energy center available at work station	Few workshops and seminars available for staffs

2.4.8 The Roles of CED Student in the Project

The role of CED student's is to making sure that plans and activities of the project (Janja Improved Stove for Sustainable Economic Development: Maji Ya Chai Community Women Training) are implemented as they are planned.

a) To mobilize and create awareness to Maji ya Chai community members on improved stove (Janja Stove) project.

b) To facilitate capacity building to WODSTA CBO leaders, project participants, and project staff.

c) To facilitate the purchase of project tools and equipments

d) To facilitate the entrepreneurships training

e) To facilitate and coordinate the promotion of renewable energy use .

f) Collaborate with CBO leaders and other professionals to conduct monitoring and evaluation of the project.

CHAPTER THREE

3.0 LITERATURE REVIEW

3.1 Introduction

This chapter review different literatures on previous projects/research studies and reports closely related to renewable energy. The chapter is divided into four parts: theoretical literature, empirical literature, policy reviews and the literature review summary. In theoretical reviews, the emphasis is to analyze the economic theories behind renewable energy. In empirical review, the objectives is to present literature done by other projects/researchers and relate it with this study, with interest on methodology used, outcomes and challenges arose in contrast to the intended Janja Stove project. In this empirical review, the study focus on both level starting from Developed world, Third World countries, East Africa Community (EAC), Tanzania, Arusha as well as Maji ya Chai.

The third part is policy review, the review was done on various related policy on renewable energy in Developed world, Third World countries, in East Africa Community (Tanzania, Kenya, Burundi, Uganda and Rwanda, and in Tanzania. Different source like; books, professional journals, Tanzania energy report as well as EAC energy report. The last part is Literature review summary. In this part the research/knowledge gap is stipulated in relation to the study.

Renewable energy is energy which can be obtained from natural resources which can be constantly replaced. Generally it comes from natural sources in which the user can

derive/replace the energy without complication. It is most common environmental friendly form of energy which is promoted worldwide by International organization, governmental and non-governmental organization as a means of protecting environment and saving cost from other non-renewable energy sources. The most common sources of these renewable energy sources are; bioenergy, geothermal energy, hydropower, ocean energy, solar energy and wind energy. It replaces other non-renewable form of energy.

3.2 Theoretical Literature

3.2.1 Theory of Peak Oil

Peak Oil theory states that: any finite resource, (including oil), will have a beginning, middle, and an end of production, and at some point it will reach a level of maximum. Theory of Peak Oil is a concept based on energy theory as explained by Hubbert M (1956) by which he used oil as an example of energy to explain how the theory works. Hubbert's theory on energy is commonly known as 'theory of peak oil' by which is based on a bell shaped curve of the discovery and production of oil.

The bell shape for discoveries is derived from the observation that oil discoveries grow exponentially at first, peak, and then decline. This is because at first oil is very easy to find, thus discoveries rise rapidly (Goodstein, 2004). However, as more of these easy to find reservoirs are discovered, further reservoirs become harder to find and the rate of discovery slows. King Hubbert, in the year 1956, propound out a scientific formulate a which project peak oil production within the United States between the years 1965 and 1970. The main emphasis of the theory as stated by

Hubbert is that ‘the discovery of any source of energy at first it grows exponentially, then to the peak and finally starts to decline’.

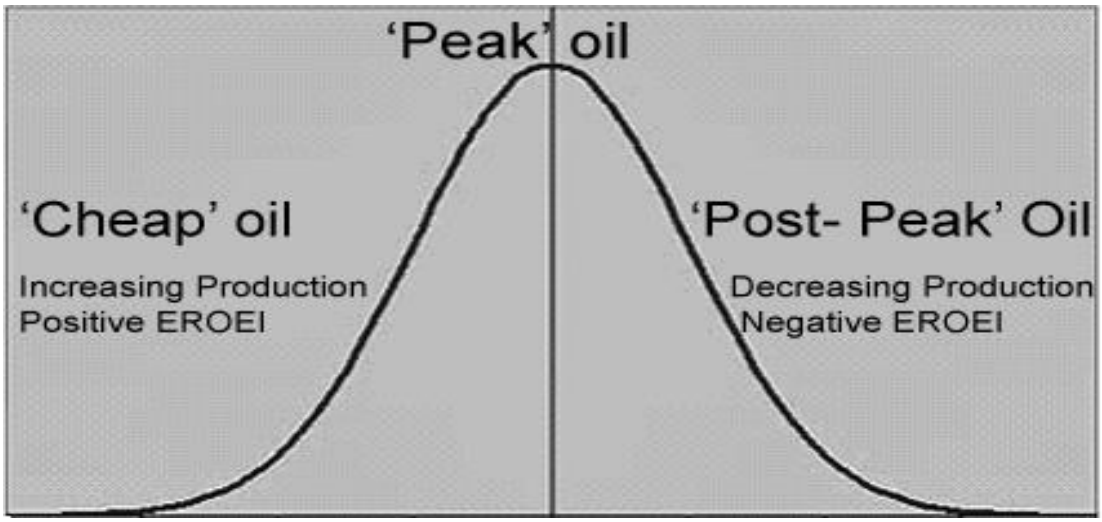

Figure 3.1: Oil Peak Theory Curve

Source: http://en.wikipedia.org/wiki/Hubbert_peak_theory

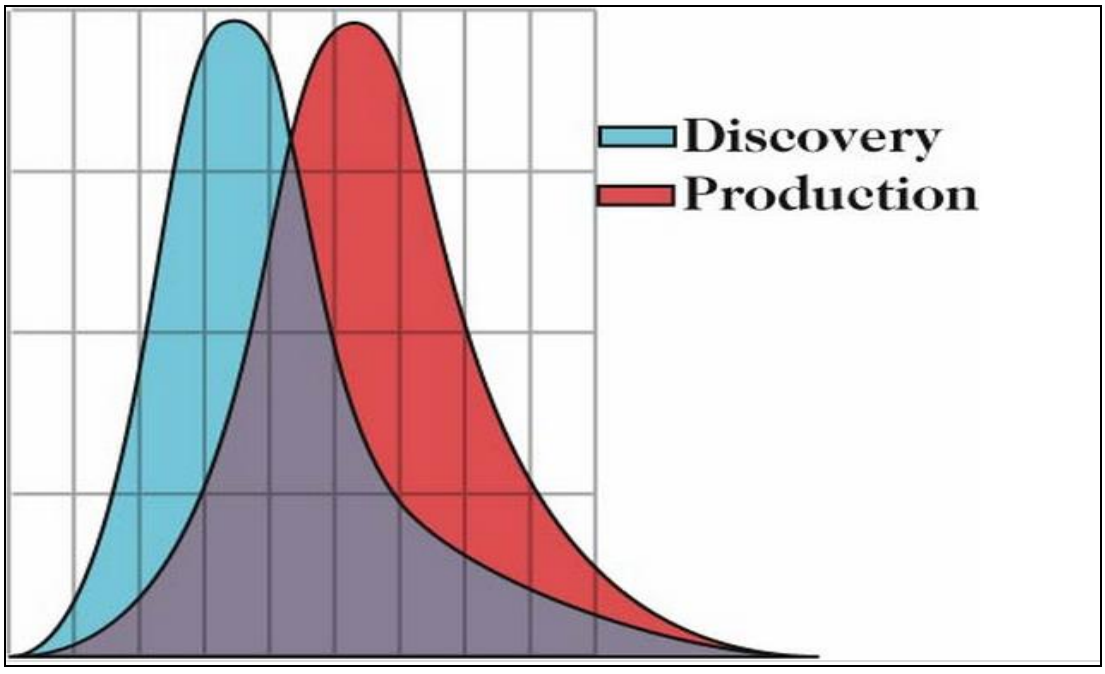

Figure 3.2: Oil Peak Theory Curve

Source: http://peakoilbarrel.com/what-is-peak-oil/

Oil as one of the example of energy explained in the theory, a global demand has increased faster than production and the once substantial cushion between world oil production and demand has decreased. This phenomenon has increased the price of oil and consequently huge amounts of American money up to $25 million per hour goes abroad to pay for foreign oil. (US 2005).

This theory is related to this study whereby massive consumption of non-renewable sources of energy such as charcoal, fuel wood, and petroleum gas without replacement energy peak will be reached for extraction of these resources. The emphasis here is the concentrates on renewable sources of energy. One of the mitigation strategy is to adopt Janja stove improves stoves, the cut down uses of fuel wood will reserve more energy for future generation.

3.2.2 Olduvai Theory

The Olduvai theory is defined by the ratio of world energy production and population. It states that the life expectancy of Industrial Civilization is less than or equal to 100 years: 1930-2030. After more than a century of strong growth — energy production per capita peaked in 1979. The Olduvai theory explains the 1979 peak and the subsequent decline. (Duncan 2001).

The theory simply attempts to explain the historic world development of energy production in relation to population data in terms of overshoot and collapse. The available energy resource does not correlate with population. The theory support economic uses of available energy resources for the long run. The use of renewable

energy sources like improved Janja stove will economize the massive consumption of firewood and charcoal.

Duncan (2001), argue that, No doubt that the peak and decline of Industrial Civilization, should it occur, will be due to a complex matrix of causes, such as overpopulation, the depletion of nonrenewable resources, environmental damage, pollution, soil erosion, global warming, newly emerging diseases, and resource wars.

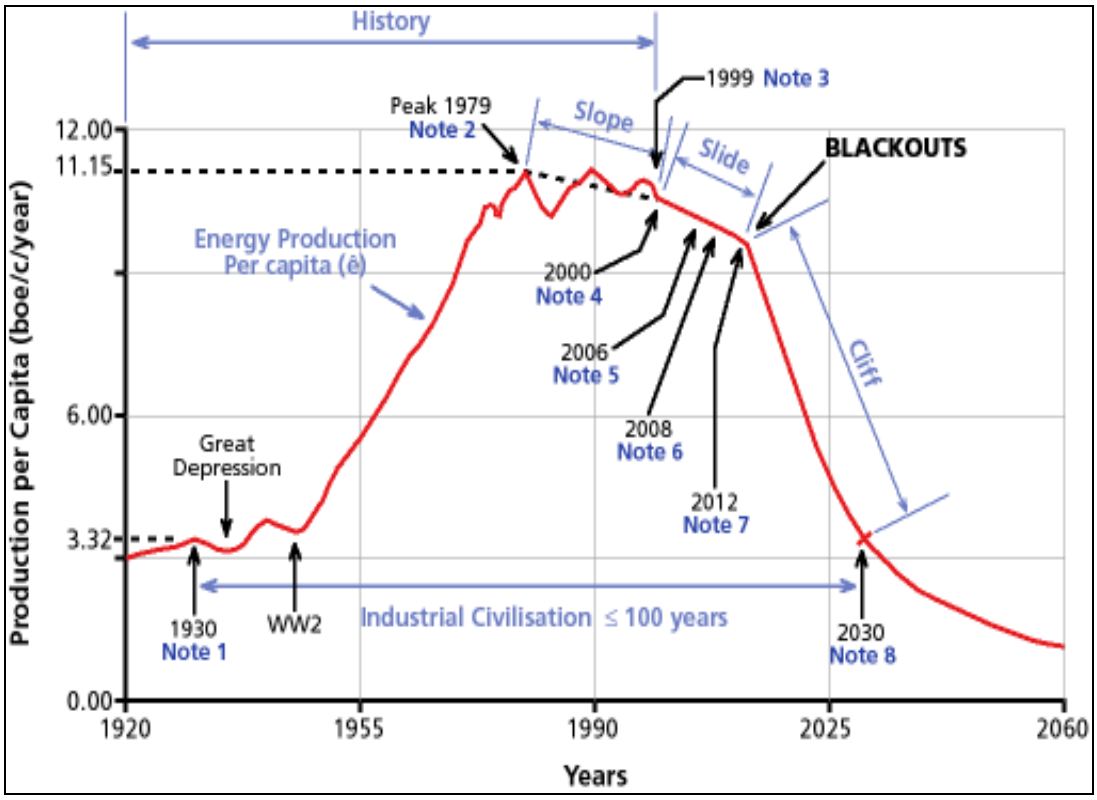

Figure 3.3:

Source: https://www.google.co.tz/search?q=olduvai+theory&client

Government and Non-governmental organizations should work perpendicularly with international organization in emphasizing the use of renewable sources of energy. The emphasis on the use renewable source energy should be accompanied by

environmental protection campaigning by emphasizing on tree plantation, proper agricultural practice, mining and settlement expansion. In the study of Cecelski E. (2000) claimed that Renewable energy will play an increasingly important role in both developing and developed countries in future. Also she argued that women need renewable energy to address their critical needs for energy.

3.3 Empirical Literature Review

3.3.1 Renewable Energy in Developed World

Renewable energy struggle in developed world went far compared to less developed countries. The entire globe looks after clean and economic source of energy. Renewable energy is suitable for both household in the community; low income, medium income as well as higher income earners. It is an essential tool for technological as well as economic development. There is a great need of third world countries to adapt quickly this technology so as to cope with technological development. United Kingdom is one of the fore front technological advanced in improved cooking stove, the most efficient wood burning stove in the world discovered in United Kingdom.

Burley's range of wood burning stoves featuring Thornhill Thermal Technology is the result of thousands of hours of designing and prototyping, based and inspired by over 100 years of experience in the heating… Designed, developed and manufactured entirely in the United Kingdom. The United Kingdom discovered the most efficient wood burning in the world. The stove is designed in efficient way of heat production. The stove consists of three part combustion. It has a primary,

secondary and tertiary combustion process. (Burley ( )

Primary combustion Primary combustion is the initial burning of the wood at relatively low temperatures. During primary burn, water is evaporated and large amounts of creosote gas are produced. This creosote holds 60% of the potential energy of the wood, but it is deposited on the inside of the stove and the lining of the chimney. In Secondary combustion the combustion chamber is insulated sufficiently to raise the core temperature and exactly the correct amount of oxygen is introduced, at 600ºC the creosote spontaneously combusts. This creates a chain reaction which rise the temperature inside the stove from 600ºC to 900ºC with no extra use of fuel. This is the secondary burn. . (Burley ( ).

Figure: 3.4: The Brampton Model 9108

Source: Field Survey (2014)

After Primary and Secondary combustion, Tertiary combustion occurs by fully burning the carbon, charcoal and ash which is left behind. These contain a huge

amount of energy and provide a long rate of heat. Anyone who has barbequed will be aware of how much heat is present in semi-combusted wood. Blacksmiths melt steel on it..... Through all these three burning process heat produced in effective and clean way (Burley)

The stove is most efficiently wood burning stove in the world. The technology adopted is most advanced one. Basing on the African ground the stove will not be efficient. In Africa cold is not a problem. Climate condition does not require indoor warming up. As it can observed in the picture of Burley stove above the Brampton model; it main uses are for indoor warming up. The energy deficit in Africa and less developed world is mainly for cooking and lighting.

According to Grosskopf (2011) In German renewable Energy sources are not only provide cheap source of power but it has become a growing sector in creating employment to its citizen. According to a study by German Agency for Renewable Energies current 367,400 people are working in renewable energy sector. This number is supposed to expand to about 500,000 in 2020. Campaigning for renewable energy will create number of employment even in third world countries. Renewable energy will also be the tool for poverty reduction by majority of women in rural areas as well as in urban areas too.

3.3.2 Renewable Energy in Third World

Renewable energy is a known and common phenomenon to most of developing world including Tanzania. The adaptation to the technology is very slow compared to

the demand/number of users in the market. There is a great need of strengthening national policy as well as international cooperation so as together could result into immediate change as also supported by Karekezi. According to Karekezi (2004). The majority of the global population lives in the developing world. It is in the direct global interest that the renewable energy transition be immediate, rapid and orderly. This requires shouldering the responsibility of both national policies and international cooperation.

According to Wennerberg *et all* (2009) The three stone open fire stove using wood as fuel is by far the most common way of cooking in Northern Ghana and is almost exclusively used in rural households. Only in Upper East where there is a scarcity of firewood are other fuels used such as crop residues and dung. It is only in urban areas that commercial fuels exist - in the rural areas wood fuel or crop residues are gathered for free in and around the communities. The uses of three stone stove is a most common used form of cooking energy in most developing world. The renewable energy initiatives only arise when there is a scarcity of wood for fuel. This is common to the third world countries, different measures have to be taken before the scarcity of fuel wood

Over the years numerous stove designs have been developed and tested in African countries. The stoves developed and found to fit the Ghanaian market are the local versions of the Kenyan Ceramic Jico (KCJ) stove now known under the names
Gyapa or Toyola stove and the Ahibenso charcoal stove promoted in the 1990s. Wennerberg *et all* (2009). As the study above stipulates that the most common type

of stove in Ghana market are Gypa which are adopted from Kenya; still these stove reproduce non-renewable energy whereby it led to massive consumption of charcoal

Figure: 3.5 Gyapa or Toyola stove

Source to Wennerberg *et all* (2009)

Women need renewable energy to address their critical need for cooking energy. Women need cooking energy that is less labor-using, more convenient, and safer. A broad view of the entire household fuel cycle needs to be taken, including not just improved stoves but kitchen and housing design, food preparation and processing, and improved technology for the ergonomic collection and transportation of firewood. (Cecelski E. 2000). Women need renewable energy supply so as to have safe and conducive cooking environment perpendicular to the transportation of firewood. The availability of renewable improved stoves will reduce firewood consumption as well as providing safer cooking environment.

Health and safety are major concerns of women in their use of biomass fuels. Smoke reduction and improved safety for children are often the two most important reasons cited by women for adopting improved stoves and fuels. In South African urban townships, the prevention of accidental kerosene poisoning of children, and the prevention of devastating housing fires caused by kerosene cooking and lighting, are important motivations given by both women and men for desiring household electrification (Mehlwana and Qase 1996; Jones, *et al*. 1996; Banks, *et al*. 1996).

3.3.3 Renewable Energy in East Africa

Thirteen women's groups (200 people) have been trained in making stoves in the Rural Stoves West Kenya project, and many have also benefited from business management training. Production is estimated at 11 000 stoves annually; the profit generated by the stoves is com- parable to wages in rural areas. As a result, the women potters have gained in status, self-confidence, and financial independence.

(Clancy 2004) Renewable energy campaigning in East Africa Community also is one of the initiatives that have been adopted for various purposes like economic sustainability, environmental protection as well as eradication of indoor pollution. Kenya is one of the country in EAC which is conducts technical and entrepreneurship training to women in the community. The training should be accompanied also by easy access of micro finance services to these women groups so that they could run daily entrepreneurship activities in the community.

In Kenya, renewable generation represents a small proportion of the total generation. It decreases from 45% in 2013 to under 10% by the end of the study period, as more

thermal plants are introduced. (East African Community 2011). There is a great demand of promoting renewable energy for mutual socio-economic development of the community. From East African Community report of 2011 of Kenya, it shown that the renewable energy use has declined by 10% this is to say in other words, deforestation, poverty and underdevelopment increased by 10%

The system in Uganda is dominated by hydro generation with renewable energy making up more than 90% of the total in the system…….. This means that the proposed future Uganda power system is not only self-sufficient but profitable to Uganda and beneficial to the region by providing cheap energy to its neighbors. In addition it is a clean system with close to 98% of its energy made up from renewable generation (Hydro, Biomass) and clean thermal generation (Geothermal). (East Africa Community 2011)

Uganda also is one of the frontier country in East Africa which act positively in Renewable energy sources. As East African Community report on Uganda stipulates that the future Uganda will produce 98% of clean renewable energy, the production of these 98% of clean renewable energy should go perpendicularly with provision of community training on renewable energy generation so as to create sustainable community in renewable energy.

The extent to which modern equipment for renewable energy use available is widely unknown. From literature research very little knowledge about such systems in Burundi is available. The role of the African Regional Center which was located in Bujumbura didn't help Burundi…. In contrast to the work on urban stoves, there has

been little progress on improved woodstoves for rural areas in Burundi. (EAC-EASU 2008) In Burundi the concept of renewable energy sources is not well known yet by its community members. Neither there is no enough research on renewable energy sources. In the struggle for community development the concept of renewable energy should be one of the national strategies.

Burundi have to adopt from its neighbors' technology so as to foster the socio-economic as well as health situation of its community member. Improved stove research started in the 1980s, resulting in the DUB Project (DUB 10), one of the most successful stoves programs in Bujumbura. Initially reduction of fuel consumption was the key objective, The maendeleo and rocket stoves, which are appreciated in the EAC, are among others must be introduced subsequently in Burundi (Hakizimana 2008).

3.3.4 Renewable Energy in Tanzania

In Tanzania the application of Renewable energy technologies went into various stages of development. The focus is on solar, wind, biomass and micro/mini hydro, (Gwang'ombe 2004) since it is felt that technologies on use of these energy sources could be disseminated in the short term. Geothermal energy also has a potential in Tanzania although its exploitation may be in the long term due to the costs of its development.

As cited by Sem (2014) High woodfuel consumption in Tanzania is ascribed to *low* per capita income and limited investment in alternative energy supplies. Yet still the

vast majority of woodfuel consumers cannot afford the high investment costs associated with those alternative commercial energy sources. The introduction of renewable energy sources will increase per capita income since entrepreneurs will gain and saves from improved cook stoves produced in the community.

Different projects are undertaken by Governmental and Non-governmental Organization to foster energy technology, Organization like WODSTA and TATEDO in collaboration with other international organization work together in provision of community training on Renewable sources of energy for sustainable Socio-economic development. The concept of renewable energy sources also in Tanzania compared with currently population of 44,928,923 (NBS 2013) of people only 52.9% of community members have awareness of renewable energy as this study found.

According to URT (2013), a number of private companies are engaged in small renewable power development under the SPPA to sell power to TANESCO and/or sell directly to retail customers. Many of these firms are already in rural areas in other enterprises such as tea, sugar, sisal, tannin, among others. Currently 3 SPPs are selling power to the grid and an additional 8 SPPA signed with TANESCO. Developing renewable energy for commercial purposes will not create effectively economic sustainable community rather than providing education to the community on how to construct renewable energy using the available resources.

The use of three stone stove in Tanzania is common mostly in rural area, the stove is inefficient since it let heat to escape in which led to massive consumption of

firewood. The massive consumption of firewood brings a huge task for women and children who are responsible for collecting firewood for household.. Women and children, who are primarily responsible for gathering fuel wood, spend two to three days each week collecting and then carrying wood on their backs or heads. (Holmes 2011).

3.3.5 Renewable Energy in Arusha and Manyara

In Arusha and Manyara region the use of three stone stoves is common in rural areas as well as in urban areas. From the study conducted by Holmes (2012) shows that there is 100% rise of fuel wood price In the Hanang District of Tanzania, women reported that fuel wood doubled in price over a two-year period from 2005 to 2007; small bundles of wood went from 300 Tanzanian shillings (TSH) to 600 TSH; larger bundles went from 500 to 1000 TSH. Most residents of Measkron Village, Hanang District are not able to afford other cooking options 5 and are therefore, dependent on fuel wood (Holmes 2011).

In Arusha, Tanzania – Mobisol, the German based provider of solar electrification via installment plan, inaugurated by the *Mobisol Akademie*. The mobisol created so as to train and equip its technicians and sales agents with the optimal knowledge and tools to effectively service Mobisol's customers to the Arusha community. There is a deficit in provision of skills on improved stove as they mainly important to the communities compared to lighting. (Demello 2014).

3.3.6 Renewable energy in Maji ya Chai

In Maji ya Chai, different measures have been employed by Meru district council in

solving the energy crisis. One of it is the introduction of Jatropha oil for lighting and cooking. Experience of use of Jatropha oil in cooking and lighting is found on drier areas of Meru District, example Leguruki ward and Kikatiti. Farmer are planting woodlots of Jatropha species around there are farm which later are used to extract oil. (URT 2011) the shortcoming of this technology is that, not all household can afford in buying these technology. Also there is scarcity of availability of jatropha plants in the area these result them in buying finished goods.

Meru district also facilitate various training on adaptation of new available technology in lighting and cooking. The District facilitates the exchange of information between secondary education and technical institutions. The Educational officers make sure there is exchange of information between the technical institutions (CAMARTEC, Arusha technical college, VETA) and the student.ts. (URT 2011).

The renewable energy sources will create employment opportunities by involving regional, local stakeholders and other beneficiaries in the domestic renewable industry. With this community development will be propelled by income generated by practitioners in the field. Reduction of global and local pollutants will be an added advantage on this sustainable domestic industry, most of renewable energy are friendly to the environmental therefore it will be of potential use.

Renewable energy is linked with human sustainable development, since most of women are responsible for energy preparation, seeking and running, RES will expand the role of women development in the community by provide them with

other opportunities of resources (time, money, labor) allocation. Women are playing a great role on community development, they provide family care including house work, looking after children and involving themselves on other economic activities, by provide them RES will enable them to increase other socio-economic performance.

3.4 Policy Reviews

Tanzania National energy policy recognize Renewable energy source and appreciate it, it set various strategic ways for implementation from the grass root level. An interactive and participatory process between Government, other stakeholders and relevant groups has been necessary as part of the formulation process in order to incorporate views of market actors and energy consumers to address the complex nature of the sector. Specifically, the revised energy policy takes into consideration the need to:

a) Have affordable and reliable energy supplies in the whole country;
b) Reform the market for energy services and establish an adequate institutional framework, which facilitates investment, expansion of services, efficient pricing mechanisms and other financial incentives;
c) Enhance the development and utilization of indigenous and renewable energy sources and technologies;
d) Adequately take into account environmental considerations for all energy activities;
e) Increase energy efficiency and conservation in all sectors; and
f) Increase energy education and build gender-balanced capacity in energy

planning, implementation and monitoring. (National Energy policy, 2003)

Renewable energy technologies currently in use in the country include improved wood-fuel stoves and charcoal production practices, biogas, windmills, and solar thermal and photovoltaic (PV). The applications of these technologies are at various stages of development in terms of demonstration and commercialization. (National Energy Policy, 2003).

There is a need for adequate physical demonstrations on renewable energy and energy efficiency to pupils and students. It is, therefore, necessary to include energy education, in particular, renewable energy and rational use of energy, in curricula for schools, vocational training centers, colleges and other learning institutions. There is also a need for mass educational and promotional efforts on energy issues targeted to the public.

Policy Statement 64: Encourage energy education in school curricula, vocational training centers, colleges and other relevant learning institutions; emphasis should be on practical aspects including physical demonstration, installations and operation.

Policy Statement 67: Promote and co-operate regionally and internationally on research and development of energy forms and of related advanced and innovative environmentally sound technologies in the energy sector. 61. Facilitate education and training for women in all energy aspects.

Policy Statement 62: Promote awareness on gender issues concerning men and women's social roles in the energy sector, including training on appropriate technologies. . (National Energy policy, 2003).

With emphasize from the National Energy policy of providing education in all levels and involving a woman as the way of promoting gender equality, will enhance communally adaption of renewable energy throughout the entire community.

The Renewable energy promotion it is not only at national level, International organization and other foreign stakeholders also pay an attention on this matter. According to International Solar Energy Society: Renewable Energy future for the developing world (2005), developed several policies for the developing world; Establishment of transparent, con- sis tent long-term targets and regulatory frameworks, financial interventions and incentives, Government supported renewable energy technology, Research, Development and Demonstration, and education, Encouragement of stakeholder/ public ownership, participation and pride.

3.5 Literature reviews Summary

There is a great need of promoting renewable energy awareness basing on gender issues concerning men and women's social roles in the energy sector. Also including training on appropriate technologies by Demonstration, and Research Development. Enhance the development and utilization of renewable energy sources and technologies will foster sustainable economic development of the communities.

CHAPTER FOUR

4.0 IMPLEMENTATION

4.1 Introduction

This chapter comprises of information on how the project was planned, both planned and actual implementation strategy of the project derived from community needs assessment. It gives the original plan of the project and the implementation process, it also analyses products and output from the project, activities undertaken to meet the objective, resources required, responsible personnel and time frame to accomplish the project. It also narrates action taken at each step of project implementation, tentative budget for the purchase of equipments and other running cost of the project, report and staff pattern.

Apart from above it also shows commitments from various stakeholders who showed great interest and support the project implementation during the focus group discussions and interview. These commitments include WODSTA CBO the implementer of the project, support of funds TZS. 1,200,000/= , various village executive officers in focus group discussion and other respondents. Mitiasili group, Ikia group, Imbata group and Tiirashike group in various stage of projects implementation.

4.2 Products and Outputs

The expected product and output of the establishment of Janja stove project in Maji ya Chai ward was to have reliable and viable Source of power, trained personnel in construction of Janja stove, collaboration with other stakeholders / development

partners, gained knowledge, experiences and entrepreneurial skills that enable efficiency in Janja stove construction as per market demand. The outcome is expected to be reached after realization of derived from the project.

In order to meet the goals the following activities were planned and accomplished with the exception of inauguration of Janja stove project and evaluation of project implementation that will take place after the project take off.

i) Conducting one day advocacy meeting to Maji ya Chai community members about the project
ii) Capacity building to 117 women.
iii) Capacity building to 20 CBO members and 4 project key players
iv) To facilitate purchase project equipments and other project costs
v) To Identify and recruit volunteers who will provide their technical assistance in the project
vi) Arrangements of project areas and getting permission from local authority
    a) Prepare and distribute brochures with information of Janja stove Project
    b) Inauguration of Janja stove project
    c) Monitoring and evaluation of project implementation

4.2.1 Achievements

A total number of 117 women in Maji ya Chai ward trained on product quality improvement, processing basic business management skills and marketing. Linking women to credit facilities, dissemination and publicity of different appropriate technologies; improved stoves such as wonder basket/fireless stoves, biogas and

solar cooker. 117 women trained on how to construct and install appropriate technologies. 117 women supported in environmental and other income generating activities that increase women's economic empowerment, promotion of gender sensitivity.

4.3 Project Planning

Project planning is the major component in the project development process. The following is a list of activities needed to accomplish each objective includes people responsible, input, output, time frames and other resources required.

a) Identifying (JSP) project objectives

b) Sequencing project activities

c) Identifying responsible person for carrying out specific project activities

d) Identifying facilities, equipments and service needed

e) Preparing the budget

4.3.1 Implementation Plan

In order to ensure precisely implementation of the project, a work plan was prepared indicating different activities to be carried out, the required resources, time frame and person responsible for each project objective. Project implementation involved different stakeholders physically and others were consulted in their working places to get their views and perception especially on technical matters. The host organization WODSTA CBO leaders was fully engaged from the beginning of the project as they are key implementers of the project. The implementation follows the project implementation plan as shown on table 4.1

Table 4.1: Project Logical Framework

Hierarchy of Objectives	Objectively Verifiable Indicators (OVIs)	Means of verification (MOV)	Assumptions
Goal (Impact): Community Economic sustainability of Maji ya Chai Villagers	Increased income & improved standard of living of Maji ya Chai Villagers.	Survey and auditing monthly, semiannual and annual sales reports at beginning and end of project at energy centers	People are aware and keep records on incomes and expenditures.
Objective 1: Identification of various sources of energy used in the study area by November 2013			
Output 1: CBO members to conduct survey on household energy usage.	Response of CBO and community members	Survey progressive report	Projection of Different sources of energy used in the study area.
Activities			
1.1 Advocacy meeting done with Maji ya Chai Village and Ward Executive Officers	22 Village and Ward Executive Officers attended	Project progressive report	Readiness of Village and Ward Executive Officers to support the project.
1.2 Prepare and distribute survey questions	100 survey questions prepared and distributed	Project progressive report	Respond from the community.
Objective 2: Awareness creation to the community on Renewable Energy.			
Output 2: Maji ya Chai community members and CBO members mobilized and sensitized about the project.	Response of CBO and community members	Project progressive report	Community members became aware about the project
Activities			
2.1Advocacy meeting done to Maji ya Chai community members.	117 Community members attended	Project progressive report	Readiness of community members to support the project.
2.2 Prepare and distribute brochures	200pcs of brochures prepared and distributed	,,	,
Objective 3: Analysis of cost variation of different sources of energy used in the study area.			
Output 3.Cost analysis of different sources of energy used in the study area.	Analysis of different energy used in the study area	Project progressive report	Different on various sources of energy
Activity.			
3.1 Survey on prices of energy was conducted	Prices of different energy were obtained.	Project report	Different on various sources of energy

Objective 4: Capacity building to community on Janja Stove.			
Output 4. VEO and WEO, Community members trained on project development and management.	Number of CBO VEO, WEO, Community and project staff attended	List of participants	Willingness and readiness of CBO Members to participate in training
Activities.			
4.1: Conducting training to the community on importance of renewable energy and theoretical ways of making Janja stove	117 Community members attended the training.	Attendance.	Attendance in all training days
4.2. Conducting practical training on Janja Stove construction	117 community members trained.	Training report	Willingness of community to attend the training.
4.3. Conduct Entrepreneurships training to the community	117 community members trained	Training report	Willingness of community to attend the training.
4.4. Conducting study tour to the energy centers	117 participants visited the energy center project	Study tour report	Funds available for study tour
Objective 5: Examination of viability of Janja Stoves project in the community.			
Output 5. Reduction of massive consumption of firewood and charcoal	Reduction of massive cutting down of trees for charcoal and firewood.	Vegetation progressive.	Reduction of massive cutting down of tress, regeneration of heat of Janja stove
Activity.			
5.1. Conducting a Monitoring and Evaluation.	Fuel saving from Janja Stove.	Reduction of massive uses of fuel	Efficient energy generation by Janja stove
Objective 6: Analysis of cost effectiveness of Janja stove in the community.			
Output 6. Energy cost reduction.	Financial savings from buying energy.	Financial savings from energy.	Community will save currency on energy
Activity.			
5.1. Conducting a Monitoring and Evaluation.	Financial saving from Janja Stove.	Reduction of massive uses of currency in buying fuel	Financial saving from Janja stove.

Table 4.1: Project Planning Matrix for CED Proje

S/N	Activity	Objective	Output	Input	Resources			Responsible Part	Time frame
					Human	Material	Financial		
1	Development of the Problem statement	To identify various source of energy used in the study area	Problem statement	Documents from CBO	CED students CBO Staff Community Members Extension Worker	RE reports and Survey results	0.5 Mil	CED-Student CBO-Staff	Nov 2013
2	Awareness creation	To create awareness to the community on renewable energy.	Community Needs Assessment Report	Interview Checklist and questionnaires and	CED student CBO Staff, Community Members Extension Worker	Community Profile Report	0.8 Mil	CED-Student CBO-Staff	Dev 2013 & Jan 2014
3	Working with CBO and community for data collection	To analyze cost variation on different sources of energy used in the study area.	Data and information sustainability of the project	Documents from CBO, Interview checklist and questionnaires	CED student, Co-surveyors	CBO reports	1.4Mil	CED students, Co-surveyors	Feb 2014 to Apr 2014
4	Groups training	Capacity building to CBO staffs, women groups and community on Janja stove	117 members of groups trained on RE	Training manual on RE	CED student, Co-surveyors	Stationary, flip charts, marker pen, pen, notebook	3.0Mil	CED students, Co-surveyors	May 2014
5	Examination	To examine perception of janja stove in the community	Examination report	Groups Performance Report and RE Reports	CED- Students and CBO	Stationary, flip charts, marker pen, pen, notebook	0.45Mil	CED-Student, Co-surveyors	Jun 2014
6	Analysis	To analyze cost effectiveness of Janja stove in the community.	Analysis report	Documents from CBO, Interview checklist and questionnaires	CED- Students and CBO	Stationary, flip charts, marker pen, pen, notebook	0.5Mil	CED-Student, Co-surveyors	

Source: Survey Design, 2014

4.3.2 Inputs

Included physical, material, financial, human and social resources:

Table 4.2 Inputs

S/N	Type of input	Quantity	amount
1	Trainings aids and stationary		3.0 Mil
2	Training venue	4	6.0 Mil
3	Facilitators	2	1.5 Mil
4	Coordinator	1	0.6 Mil
5	Co-facilitators	4	3.0 Mil
6	Good will of facilitators		
7	Good will of CBO members		
8	Active participation of members		

Source: Survey Design, 2014

4.3.3 Staffing pattern

The implantation of the project had the following staff pattern

i) WODSTA staffs provided training in the program.

ii) The other stakeholders such as CARMATEC, ATC provided consultation support to the project,

iii) The CED student was involved in the facilitation of the training as stipulated in 2.3.8 above.

iv) Extension staff (the Community Development office and the Cooperative officer were involved in the facilitation o f the training program

4.3.4 Project budget

The total project budget was TZS.15,380,000. Out of the total budget 10,000,000 cash was a contribution from CBO donated by Austrian Women Catholic Development Fund. The rest was donated in terms of equipments worthy TZS.

5,380,000 by Center for Agriculture Mechanization and Rural Development, Arusha Technical Collage and beneficiaries contributed the work force.

Table 4.3 Budget

Promotion of Renewable Energy Sources in Arumeru District September 2013- June 2014

NO	BUDGET ITEM	UNIT	UNIT COST	QUANTINTY	TOTAL COST (TZS)
1	**Personel cost.**				
	Project Coordinator net salary	Month	860,000	12	10,320,000
	Social Security (NSSF)	Month	172,000	12	2,064,000
1.1	**Project Coordinator Gross Salary**		**1,032,000**	**12**	**12,384,000**
	Project RE Technician	Month	680,000	12	8,160,000
	Social Security (NSSF)	Month	136,000	12	1,632,000
1.2	**Project RE Technician Gross salary**		**816,000**	**12**	**9,792,000**
	Watchman 25% salary	Month	71,500	12	858,000
	Social Security (NSSF)	Month	14,300	12	171,600
	Watchman Gross Salary		85,800	12	1,029,600
	Secretary 75% Salary	Month	195,000	12	2,340,000
	Social Security (NSSF)	Month	39,000	12	468,000
1.3	**Secretary Gross salary**		**243,000**	**12**	**2,808,000**
	Account assistant 50% salary	Month	261,700	12	3,140,400
	Social Security (NSSF)	Month	52,340	12	628,080
1.4	**Accountant Assistace Gross salary**		**314,040**	**12**	**3,768,480**
	Office Attendant 50% salary	Month	92,000	12	1,104,000
	Social Security (NSSF)	Month	18,400	12	220,800
1.5	**Office Attendant Gross salary**		**110,400**	**12**	**1,324,800**
1	**Sub Total personel**				**31,106,880**

37% total project cost

2	**Overhead cost**					
2.1	Management team expenses	Week	105,000	46	4,830,000	
2.2	Driver	Day	15,000	138	2,070,000	Hired on daily basis
2.3	Water 20%	Month	30,000	12	360,000	
2.4	Electricity 20%	Month	40,000	12	480,000	
2.5	Telephone fax 20%	Month	20,000	12	240,000	
2.6	Internet 20%	Month	25,000	12	300,000	
2.7	Mobile phone card	Month	30,000	12	360,000	
2.8	Transport/fuel	Kilometers	1,100	1,000	1,100,000	
2.9	Computer maintenance	Month	30,000	12	360,000	
2.11	Bank charges	Month	180,000	12	2,160,000	
2.12	Planning and evaluation	Year	83,333	12	1,000,000	
2.13	Office supply 50%	Year	50,000	12	600,000	
2.14	Maintenance and general repair	Month	60,000	12	720,000	
2	**Sub Total Overhead cost**		**669,433**		**14,580,000**	
3	**Programme Cost**					
1.0.	**Output 1: Improved accessibility and adaptation of appropriate technologies**					
	Construction of janja stove					
	Bricks		200	595	119,000	
	Cement		16,000	8	128,000	
	Limestone		10,000	8	80,000	
	Rings		30,000	4	120,000	
	Shutter/doors		30,000	4	120,000	

	Chimney		40,000	2	80,000
	Transportation of materials	1,100	50,000	2	100,000
	Fuel	3	8	70	616,000
	Staff night stay out	10	8	15,000	360,000
	Lunch for participants Olkokola	20	8	6,000	480,000
	Lunch for participants Majiya chai	10	8	6,000	960,000
	Lunch for participants Olkokola	20	8	2,000	160,000
	Lunch for participants Majiya chai			2,000	320,000
	Sub- Total				**3,643,000**
	Training to energy kiosk owners/sellers on RE demonstration and marketing/sales				
2.0.	**Output 2: Increased number of households who adopt the use of Renewable energy technologies**				
	Fuel/transport	1	1,100	500	550,000
	Radio session airing charges 45min	3	300,000	3	900,000
	Tv program airing	1	1,000,000	1	1,000,000
	Participants fair	100	2,000	1	200,000
	Lunch for participants	100	6,000	1	600,000
	Radio/video programmer allowance	1	30,000	6	180,000
	Session preparation (Filming and editing)	1	3,200,000	1	3,200,000
	Staff night stay out	6	15,000	2	180,000
	Subtotal				6,810,000
3	Training to communities RE groups on RE				
	Fuel/transport	Mileages	1,100	1,000	11,000,000
	Lunch for participants	pcs	6,000	400	2,400,000
	Communication	phone card	10,000	6	60,000
	Stationary and printing	lump sum	120,000	2	240,000

	Staff night stay out	persons	15,000	6	90,000
	Transport for participants	persons	2,000	400	800,000
	Management team expenses	persons	35,000	6	210,000
	Subtotal				4,900,000
	ToT Training for Technicians				
	Output 2: Harmonized Weather and Environmental Condition by Reducing Cutting Down of Trees				
	Training to community RE groups on proper use of tree product in making pellets/briquettes.				
	Fuel/transport	Mileages	1,100	1,100	550,000
	Lunch for participants	pcs	6,000	200	1,200,000
	Communication	phone card	10,000	6	60,000
	Stationery and printing	lump sum	120,000	2	240,000
	Staff night stay out	persons	15,000	6	90,000
	Transport for participants	persons	2000	200	400,000
	Management team expenses	persons	35,000	3	105,000
	Subtotal				**2,645,000**
	Grand Total				**63,684,880**

4.4 Project Implementation

The implementation of the project was through participation of all stakeholders including; CED student, cooperative officers, volunteers, women groups, CBO and Community Development officers. It started by identifying the basic inputs for the project implementation, introducing the project to the district as well as ward administration. After introducing the project to the District and ward administration, with the help of village executive officers community organizes and form groups for projects. Once the groups are formed in village wise, theoretical training followed by practical train are implemented to the community to ensure successful impart of knowledge to the entire community.

After training on renewable energy construction, the entrepreneurship skills training are followed so as the community could benefit from acquired knowledge. Monitoring and evaluation is the final stage of project implementation. The following table (table 4.4) stipulates the actual project implementation from the beginning to the end of the project.

Table 4.4: Project Action Plan

Activity	Objective	Duration	Output	Resources			Status of Implementation	Comments
				Human	Material	Financial		
Introducing Project to District commissioner and Ward council (WEO)	Awareness	November 2013	Mobilize communities	CBO		20,000	Complete	
Forming groups	To get clear situation of the gap existing between real and ideal situation	December 2013	Mobilized communities	Researcher, CBO & stakeholders	Stationary	200,000	Complete	
Theoretical training on Renewable energy	To give insight to the community on types, uses and important of renewable energy.	Jan 2014 To Feb 2014	Skillful trained community members on renewable energy	Researcher, CBO & stakeholders	Stationary	23,400,000	Complete	
Practical training on Renewable energy	To emphasize practical construction, use and maintenance of renewable energy sources	Mar 2014 To Apr 2014	Practical oriented community on renewable energy sources	Researcher, CBO & stakeholders	Stationary Construction materials (Cement, stones, sand, wire, nails, hummer, shovel, bricks, limestone, chimney e.t.c)		Complete	
Entrepreneurship skills training	To facilitate entrepreneurship skills and practice to the stakeholders	May 2014	Entrepreneurs	Researcher, CBO &stakeholders	Stationary		Complete	
Monitoring and Evaluation		June 2014		Researcher, CBO & stakeholders	Stationary		Complete	

Source: Survey Design, 2014

4.3.1 Project Implementation Report

The project implementation was the task of CED student, targeted groups and other stakeholders of the project to ensure that project activities are effectively implemented as intended. The implementation started by early November, 2013 as it stipulated in the project plan which followed the sequential order of the activities that result Janja Stove project objectives achievement. The project implementation was done in a participatory way involving various stakeholders.

The implementation was divided into five dimensions one of it being identifying various forms of energy used in the study area. Community awareness on renewable was second step on implementation, followed by cost analysis of different form of energy used by community members. From cost analysis, Capacity building was another important stage in implementation while Cost effectiveness of Janja Stove was the last step in project implementation.

The researcher study various forms of energy used in the study area through observation and questionnaires. Community members adapt various forms of energy, due to the low income many people use firewood as the main source of energy, few with medium income adopted renewable energy sources. Both private and public institution like schools, church they are mainly using fire wood as the main cooking energy.

Apart from firewood, charcoal is the second source of energy mostly used by the Maji ya Chai villagers. Both of the energy being derived from tree product the factor

which results into massive cutting down of trees and lead to many environmental and weather impact to the global at large. The researcher learned from the community that; there are several reported cases of women being trespassing into Arusha national park in searching of firewood.

From the study it observed that most community members depend on fire wood as the main source of cooking energy. Different kinds of stoves have been designed trying to reduce / economize fire wood usage, some of the household adapt renewable source of energy like biogas as the result of previous CBO renewable energy projects on biogas in the community. In this observation also few household use electricity, gas stove and kerosene as stipulated in pictures below as the result from survey.

As the identification process showed up little awareness of renewable energy to the big number of population, creating awareness was a second stage of implementing the janja stove project. Groups of women were formed basing on villages. The researcher, CBO and other stake holders facilitated community learning on various types of renewable energy and their socio-economic importance. Community awareness was archived through many ways.

Focus group discussion was one of the method adopted to in learning, participants sat on groups and discussing various problem. Lecturing also in creating community awareness was used. Both participants participated in focus group discussion and delivered a lecture from different stakeholders.

Figure 4.1: Participants Learning Through Lecture

Source: Study Findings, (2014)

Figure 4.2: Focus Group Discussion

Source: Study Findings, (2014)

Cost analysis of different form of energy used by community members was done. This was purposely done so as to have distinction cost between renewable energy and no-renewable energy. The results shows 35.7% of people spends 30,000 Tsh monthly on charcoal, 27.1% spends 10,000 each month in kerosene, 76% of people are not using gas. This is because of expensiveness of gas. The only 11% using gas spend 35,000 Tsh on monthly maintenance cost of stove. 20% of people connected with national grid electricity spend 10,000 Tsh each month and 17.4% use 15,000 Tsh in buying fire wood. From the analysis, a big population is using charcoal, followed by kerosene, electricity and firewood. Gas is the last option.

Capacity building to implementers(women groups, targeted group, CBO, Project staff). Training was conducted in collaboration with Arusha Technical Collage (ATC) and Center for Agriculture Mechanization and Rural Development.

Figure 4.3: Capacity Building on Entrepreneurship

Source: Study findings in Maji ya Chai Village (2014)

Lecture method and simulation exercise was used in capacity building to the learning groups. As well as practical study and study visit. The CED student in collaboration with WODSTA staff, and other stakeholders participated fully in all arrangement of Janja stove project to take off. Monitoring of day to day programs was conducted under the supervision of CBO committee members CED student and CBO leaders. Evaluation of the progress of project implementation will be done later as the project is in progress, therefore CBO and sector professionals and various stakeholders will conduct mid and annual evaluation after the take off of the project.

Table 4.5: Project Implementation Gantt chart

Objective	Output	Activity	Project Month											
			1	2	3	4	5	6	7	8	9	10	11	12
1.To identify various source of energy used in the study area	Problem statement	Development of the Problem statement	■											
2.To create awareness to the community on renewable energy.	Community Needs Assessment Report	Awareness creation		■	■									
3.To analyze cost variation on different sources of energy used in the study area.	Data and information sustainability of the project	Working with CBO and community for data collection				■								
4.Capacity building to CBO staffs, women groups and community on Janja stove	117 members of groups trained on RE	Groups training					■	■						
5.To examine perception of Janja stove in the community	Examination report	Examination							■					
6To analyze cost effectiveness of Janja stove in the community.	Analysis report	Analysis								■	■	■	■	■

CHAPTER FIVE

5.0 PROJECT PARTICIPATORY MONITORING, EVALUATION AND SUSTAINABILITY

5.1 Introduction

This chapter stipulates participatory monitoring, evaluation and sustainability. This chapter is divided into the following parts; monitoring information system, participatory monitoring methods, participatory monitoring plan, participatory evaluation plan, performance indicator, participatory evaluation methods, project evaluation summary and project sustainability.

According to De Conic J. 3. (1995:5), monitoring is a continuous process which will be done from the commencement of the research project: It compare progress o f an activity with the original plan: this is based on the following main areas: Analyzing the current situation

i) Identifying problems and finding solution,
ii) Discover trends and patterns,
iii) Keeping project activities on schedule,
iv) Measuring progress towards and formulate or revise future goals, and
v) Making decisions about human, financial and material resources
vi) Monitoring is the systematic collection and analysis of information as a project progresses. It is aimed at improving the efficiency and effectiveness of a project or organization. It is based on targets set and activities planned during the planning phases of work. It helps to keep the work on track, and can let

> management know when things are going wrong. If done properly, it is an invaluable tool for good management, and it provides a useful base for evaluation.(Shapiro J. 2001)

Evaluation is the comparison of actual project impacts against the agreed strategic plans. It looks at what you set out to do, at what you have accomplished, and how you accomplished it. It can be formative (taking place during the life of a project or organization, with the intention of improving the strategy or way of functioning of the project or organization). It can also be summative (drawing learning from a completed project or an organization that is no longer functioning). Someone once described this as the difference between a check-up and an autopsy! (Shapiro J. 2001).

Monitoring is the process of conducting the implementation of day to day activities of the project and facilitates it to make improvements so as to reach the intended goals. Evaluation is defined as systematic investigation of the progressing project basing on the worth or merits of an object. Monitoring and evaluation are linked together since monitoring pave way for evaluation. Thus monitoring and evaluation helps in accumulating information that will ensure progressing run of the project as well as predict problems and formulate strategies for effective project accomplishment.

Through monitoring and evaluation the progress trend from community participatory needs assessment, problems identification, with insight from literature review and

project implementation the researcher could have entire development of the project as well as drown effective conclusion and recommendation.

5.2 Participatory Monitoring

Participatory monitoring is the act of simultaneously gathering information on all matters from the implemented project which involves the members of the group/community. Participatory monitoring can be carried out using various techniques and methods. It is a system of collecting information and use it so as to determine the progress of the project. Participatory monitoring was intended to monitor the implementation of daily activities that include advocacy meeting to the Maji ya Chai community members, rising community awareness on renewable energy, conducting lobbing and advocacy meeting to other stakeholders, purchase of project implementation tools and equipments, facilitation of entrepreneurship.

The involvement of CBO members and other stakeholder's visits in all stages of project implementation, give them awareness of project development and hence creates room for decision making.

5.2.1 Monitoring Information System

Is a system designed to collect and report information of a project and project activities that help project manager to plan, monitor and evaluate the operations and performance of the project. For Janja stove project, monitoring information system was intended to establish a data base by recording relevant information to activities that were planned in a specified period. The information required were project

available resources and needed resources for accomplishment of the project, available staff and required one, product demand and supply, project customers, project stakeholders, training required and actual implementation strategies, number of project participants, information of funds received and expenditure and list of tools/ equipments.

The CED student together with WODSTA committee members and group leaders prepared a daily recording sheet that stipulates daily proceedings. This was important since the CBO committee members are responsible to check daily records which will enable him/her to prepare a week report to be presented in a monthly meeting.

5.2.2 Participatory Monitoring Methods

In participatory monitoring, various methods and techniques were employed to involve CBO members and other stakeholders in monitoring project activities. The PRA key principles and techniques were used to gather information which includes key informants interview, documentation and observation**.** The analysis done on the Janja Stove construction sites and at the project center helped to make some improvement on daily recoding sheet**.**

5.2.2.1 Key Informants Interview

The researcher accumulated information through key informants that includes extension staffs, CBO committee members and district officials and formulates various strategies for project implementation. Through discussion they agreed that training will be delivered on four villages (Ngurdoto, Maji ya Chai, Kitefu and

Imbaseni), and those who received training will become trainers of others (ToT) and could render the service to the community without limitation.

5.2.2.2 Observation

The researcher in collaboration with CBO members and other stakeholders observed if all activities are implemented as planned. Thus observed training and advocacy meeting carried out, number of project participants attended, tools and equipments purchased for project and other arrangements for project to take off in effective way. This includes recruitment of project full time technicians and their performance to their daily routine and identification of other new energy centers.

5.2.2.3 Documentation.

Apart from above methods, documentation of monthly minutes derived from meetings, were employed in this participatory monitoring. The CBO members will get feedback on project development. The CBO secretary was liable of taking note on each step made in the project development, especially on meetings, discussion highlighting challenges, achievements, solution and way forward for mutual succession of entire project.

The CED student, extension staff and other project stakeholders got an invitation of attending meetings and respond to any technical issues and challenges aroused from the project as experienced by community members as well as reviewing the group's plan. The forum created a room for discussion and come up with a common stand so as to reach desirable objectives. Also information about all transaction in relation to

the Janja stoves project were documented in relevant record books. Example financial transaction including invoices, receipt, and deliver note were kept in payment voucher, cashbooks, ledgers and journals.

Table: 5.1. Participatory Monitoring Plan

Objective	Output	Activities	Indicators	Data source	Methods	Person responsible	Time frame
1 To identify various source of energy used in the study area. By Nov 2013	Problem statement	Development of the Problem statement	List of sources used	CBO progressive report	Meetings, interview	CBO Members, Extension officer CED student	Nov 2014
2 To create awareness to the community on renewable energy. By Jan to Feb 2014	Community Needs Assessment Report	Awareness creation	Training report, participant attendance	CBO progressive report	Lectures, Group discussion, Simulation activities,	CBO Members, Extension officer CED student	Feb 2014
3 To analyze cost variation on different sources of energy used in the study area. By Dec 2013	Data and information sustainability of the project	Working with CBO and community for data collection	Analysis report	CBO progressive report	Meetings	CBO Members, Extension officer CED student	Dec 2013
4 Capacity building to CBO staffs, women groups and community on Janja stove. Apr 2014	117 members of groups trained on RE	Groups training	Expert community members on construction of janja stove.	CBO progressive report	Simulation activities, practical, study visit	CBO Members, Extension officer CED student	Apr 2014
5 To examine perception of Janja stove in the community. By May 2014	Examination report	Examination	Skill full entrepreneurs with improved standard of living	CBO progressive report	Lectures, Group discussion, case study.	CBO Members, Extension officer CED student	May 2014
6 To analyze cost effectiveness of Janja stove in the community. By Jun 2014	Analysis report	Analysis	Project report	CBO progressive report	Observation, documentation, key informants interviews	CBO Members, Extension officer CED student	Jun 2014

Source: Study Findings, (2014)

5.3 Participatory Evaluation

Shapiro J. (2001), argue on participatory evaluation that: This is a form of internal evaluation. The intention is to involve as many people with a direct stake in the work as possible. This may mean project staff and beneficiaries working together on the evaluation. If an outsider is called in, it is to act as a facilitator of the process, not an evaluator.

Is the process which involve together project participant in the project evaluation by gathering and analyzing information to determine whether the project is carrying out as it was planned. Deepa Narayan, (1993) also defines participatory monitoring and evaluation that "is a process of collaborative-problem solving through the generation and use of knowledge. It is a process that leads to collective action by involving all level of stakeholders in shared decision making" From the concept derived from various authors above of involvement of stakeholders and taking of collective action towards problem solving or improving situation; CBO staff, CED student and other stakeholder worked together in participatory way in evaluation.

5.3.1 Performance Indicators

Performance indicators of the Janja stove project fall in two categories qualitative and quantitative based on project objectives and project goals. To measure the performance basing on input, members were to examine resources that were utilized during the entire project which include number of hours and money spent while for output indicators involves number of CBO members, community groups and project staff trained whereby impact indicators will be measured by examining the adaption

of renewable energy. Also improved standard of life by gaining income from entrepreneurship skills acquired from the training will be part of performance indicator.

Project goal and project objectives performance indicators were developed as shown in the table below.

Table: 5.2. Project performance indicators

Objective	**Output**	**Activities**	**Resources needed**	**Performance indicator**
1. To identify various source of energy used in the study area. By Nov 2013	Problem statement	Development of the Problem statement	Stationary Facilitators Allowance	Number of energy sources used in the community.
2. To create awareness to the community on renewable energy. By Jan to Feb 2014	Community Needs Assessment Report	Awareness creation	Stationary Facilitators Allowance	Knowledgeable community on Renewable energy
3. To analyze cost variation on different sources of energy used in the study area. By Dec 2013	Data and information sustainability of the project	Working with CBO and community for data collection	Stationary Facilitators Allowance	Lower cost on Renewable energy
4. Capacity building to CBO staffs, women groups and community on Janja stove. Apr 2014	117 members of groups trained on RE	Groups training	Stationary Facilitators Allowance	Renewable energy practitioners.
5. To examine perception of Janja stove in the community. By May 2014	Examination report	Examination	Stationary Facilitators Allowance	Positive perception on Janja stove
6. To analyze cost effectiveness of Janja stove in the community. By Jun 2014	Analysis report	Analysis	Stationary Facilitators Allowance	Affordable renewable energy cost

Source: Study Findings, (2014)

5.3.2 Participatory Evaluation Methods

Participatory evaluation methods employed two methods, one being participatory rural appraisal (PRA) and participatory learning action. Both methods were employed basing on time, available resources, environment and required information. The PRA techniques employed were; Focus group discussion, Key informant Interview, workshop and Direct Observation.

The key issues to be evaluated were agreed communally during the planning meetings, Focus Group Discussion, and monthly meetings. The participatory evaluation will focus on project progress in work plan, Implementation of activities as planned, Achievement of goals and Objectives, Project success, economic impact of the project and Project sustainability. So as to have a clear understanding and flow of information, a check list were prepared to guide the discussion during the Workshop, Key Informant Interview and Focus Group.

In Janja stove Project Key informants were CBO committee members, Project coordinator, project technicians, entrepreneurs and Janja stove Customers. Observation was used to examine the information collected during the focus group discussion, key informant interview and Workshop, The collected data and information was involved investigating of project performance together with participatory evaluation objectives. That is to check whether planned activities were accomplished accordingly hence the project outcome were evaluated.

Table: 5.3. Project Evaluation Summary

Objective	Output	Activity	Performance indicators	Expected outcome	Actual outcome
1. To identify various source of energy used in the study area. By Nov 2013	Problem statement	Development of the Problem statement	Number of energy sources used in the community.	Presence large number of RE	Few available number of RE
2. To create awareness to the community on renewable energy. By Jan to Feb 2014	Community Needs Assessment Report	Awareness creation	Knowledgeable community on Renewable energy	Positive response	A total number of 117 members attended
3. To analyze cost variation on different sources of energy used in the study area. By Dec 2013	Data and information sustainability of the project	Working with CBO and community for data collection	Lower cost on Renewable energy	Big cost variation between RE and no-RE	Big cost variation between RE and no-RE
4. Capacity building to CBO staffs, women groups and community on Janja stove. Apr 2014	117 members of groups trained on RE	Groups training	Renewable energy practitioners.	Improved standard of life. Increase of income	Improved standard of life. Increase of income
5. To examine perception of Janja stove in the community. By May 2014	Examination report	Examination	Positive perception on Janja stove	Community positive perception on Janja stove	Positive performance.
6. To analyze cost effectiveness of Janja stove in the community. By Jun 2014	Analysis report	Analysis	Affordable renewable energy cost	Improvement of standard of life	Community development.

5.4 Project Sustainability

Building capacity to the women group members will equip them with everlasting knowledge into which it could be useful for them in daily sustainability. They will employ themselves and others. Jordan (1996) categorize sustainable in four main areas: Benefit, Organizational and financial

i) Benefit sustainability: There will be mutual sharing of the benefit derived from the project since members will be motivated to work hard and improve their service so as to improve standard of living: Day to day flow of benefited derived from the project will make the project sustainable.

ii) Organization sustainability; Cooperation, Good governance , clear organization structure, transparency leadership , as well as clear objective, mission and vision backed up by democratic elected leaders who are committed members and devoted one who work hard with other stakeholders will guarantee organizational sustainability of Janja stove.

iii) Financial Sustainability Viable and feasible source o f income from a variety o f sources (private and public, local, national and international,), will ensure financial sustainability.

iv) Communities will develop new products which are customer driven basing on demand and supply in the market. They will be competitive enough to remain in the market.

v) Community Sustainability women groups aimed at building sustainable communities by standing on their own feet and not dependent to their husband as the main source of family income. Through the sense of entrepreneurship, togetherness and permanently community members will

help them in achieving desirable objective and build their self-reliant community with self-esteem and integrity.

From the knowledge obtained from the training and practical, the trained groups will be able to engage itself into Janja stove production as a part of self employment. Together with training the established energy center will be a knowledge center for community learning whereby the trained persons will become the trainer of others (ToT), through this the knowledge will keep disseminating in the entire community.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

This chapter comprise of two main parts; conclusion and recommendation. It give an insight of what were the main findings from the survey and proposed way forward for solution and improvement. The report recommends to different stakeholders on how to improve the performance of Renewable energy particularly Janja stove.

6.1 Summary of Important Points

It is obvious known that energy is one of the main factor which propel any community development. The question of development came if the used energy is sustainable and affordable. Although Tanzania national energy policy states its various strategies/tools for effective renewable energy dissemination, still there is a big existing gap in between the users and suppliers of energy. Both public and private institution have to assort their effort together in promoting renewable energy not only for sustainable development but also for environmental and health security.

There is a great need of promoting renewable energy awareness basing on gender issues concerning men and women's social roles in the energy sector. Also including training on appropriate technologies by Demonstration, and Research Development. Enhance the development and utilization of renewable energy sources and technologies will enhance sustainable economic development of the communities.

6.2 Recommendations

Renewable energy sources are one of the main cost saver energy option that community can adapt, for economic development. From the study it was observed

that few community members are practitioners of renewable energy. The study derived several recommendations as follows;

i. Community training on importance of renewable energy

ii. The government should provide both financial and technical support to the isolated communities

iii. Research on other renewable energies should be done so as to propel development in the community

iv. Groups should make adequate market survey for their products.

v. Produced products should be customer oriented rather than producer oriented

vi. Micro finance and other credit facilities should easy credit access to the community members rather than provide difficult instruction which hinder borrowers.

vii. Local government authority through land council should provide free land for establishment of women energy centers, this will create more awareness to the community.

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APPENDICES

APPENDIX 1: Structured Questionnaires for Household

Structured Questionnaire for Head of Household

Dear respondents,

The questionnaire below intends to get your views and perception on community socio-economic development.

Your views and perception will be of great importance and hence contribute to community development. Information given will be kept confidentiality.

Tick where appropriate and fill the information where required.

BASIC INFORMATION

A01	Sex	1=Male, 2= Female
A02	Age	…… years
A03	Marital status	1= Single, 2= Married, 3= Widowed, 4= Divorced
A04	Household size	……. Members
A05	Head of house	1= Father, 2= Mother
A06	Family income	
A07	Level of education	1= None, 2= Primary, 3= Secondary, 4= University/college, 5= Others
A08	Major occupation	1= Farming, 2= Livestock keeping, 3= Employed, 4= Trader, 5= Farming and livestock keeping, 6= Others (specify)

GENERAL SURVEY OF ENERGY USES

B01	What are the sources of energy used in a village?	1= kerosene, 2= Firewood, 3= Solar power, 4= Hydro electric power, 5= Bio gas, 6= Others (Specify)
B02	What is the circumstance/capability of meeting the following basic needs?	Item Very Adequate Adequate Not Adequate Food ( ) ( ) ( ) Housing ( ) ( ) ( ) Health ( ) ( ) ( )
B03	What are the risks countable on energy used?	1= Time, 2= Rape, 3= Health, 4= Wild animals, 5= Others (Specify)
B04	Who make decision on	1= Father, 2=Mother, 3=Family members

	energy?	
B05	Are there any initiatives taken towards renewable energy in the community?	1= Yes, 2= No, 3=I don't know.
B06	Does the community aware of renewable energy?	1= Yes, 2= No, 3= I don't know
B07	Who is responsible to prepare used energy?	1=Female, 2=Male, 3= Both

Economic Assessment Energy Uses

C01	What are the major economic activities in the community?	1= Agriculture activities, 2=Cattle keeping, 3Food vendors, 4=Horticulture, 5= Local business
C02	Is there any Micro-finance institution in the community?	1= Yes, 2=No, 3=I don't know.
C03	Is there any Government/private project subsidize energy?	1= Yes, 2=No, 3=I don't know
C04	What is your monthly income?	1=0-10000, 2=11000-200000, 3=200500-400000, 4=400500-700000, 5>700000
C05	What is daily maintenance cost of energy used?	1=500-2000, 2=2100-3000, 3=3100-5000, 4=5100-10000 5=>10000
C06	What source of energy is sustainable in relation to the economy?	1= kerosene, 2= Firewood, 3= Solar power, 4= Hydro electric power, 5= Bio gas, 6= Others (Specify)
C07	Does the community has natural and physical resources to support energy used for long run?	1=Yes, 2=NO, 3=I don't know
C08	What is the monthly cost of the Electricity used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C09	What is the monthly cost of the energy used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C10	What is the monthly cost of the Kerosene used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C11	What is the monthly cost of the Charcoal used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C12	What is the monthly cost of the Gas used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C13	What is the monthly cost of the Firewood used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C14	Is the energy affordable throughout the year?	1= Yes, 2=No, 3=Some times, 4= I don't know

APPENDIX 2: Structured Interview Questionnaires for the Ward and Village Executive Officers

Basic Information

A01	Number of population	
A02	Dominant natives	
A03	Number of Hospitals	……Hospitals
A04	Household size	……. Members
A05	Head of house	1= Father, 2= Mother
A06	Mean Monthly Family income	
A07	Number of Public and Private Schools	
A08	Clean water supply situation	
A09	Infrastructure condition	

General Survey of Energy Uses

B01	What are the sources of energy used in a Community?	1= kerosene, 2= Firewood, 3= Solar power, 4= Hydro electric power, 5= Bio gas, 6= Others (Specify)
B02	What is the circumstance/capability of meeting the following basic needs by the Community?	Item Very Adequate Adequate Not Adequate Food ( ) ( ) ( ) Housing ( ) ( ) ( ) Health ( ) ( ) ( )
B03	What are the Environmental problems derived from mostly energy used?	
B04	Who make decision on energy?	1= Father, 2=Mother, 3=Family members
B05	Does the community aware of renewable energy?	1= Yes, 2= No, 3=I don't know.
B06	Does the Community use Renewable energies?	1= Yes, 2= No, 3= I don't know
B07	Who is responsible to prepare used energy community?	1=Female, 2=Male, 3= Both

Economic Assessment Energy Uses

C01	What are the major economic activities in the community?	1= Agriculture activities, 2=Cattle keeping, 3Food vendors, 4=Horticulture, 5= Local business
C02	Is there any Micro-finance institution in the community?	1= Yes, 2=No, 3=I don't know.
C03	Is there any energy center in the Community?	1= Yes, 2=No, 3=I don't know
C04	Does Government provide education to the community on renewable energy?	1=Yes, 2=No, 3=I don't know
C05	What is daily maintenance cost of energy used?	1=500-2000, 2=2100-3000, 3=3100-5000, 4=5100-10000 5=>10000
C06	What source of energy is sustainable in relation to the economy?	1= kerosene, 2= Firewood, 3= Solar power, 4= Hydro electric power, 5= Bio gas, 6= Others (Specify)
C07	Does the community has natural and physical resources to support energy used for long run?	1=Yes, 2=NO, 3=I don't know
C08	What is the monthly cost of the Electricity used?	know 1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C09	What is the monthly cost of the energy used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C10	What is the monthly cost of the Kerosene used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C11	What is the monthly cost of the Charcoal used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C12	What is the monthly cost of the Gas used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C13	What is the monthly cost of the Firewood used?	1= 0-5000, 2=5050-50000, 3= 51000-100000, 4=101000-200000, 5= Above
C14	Is the energy affordable throughout the year?	1= Yes, 2=No, 3=Some times, 4= I don't

APPENDIX 3: Different Stages of Janja Stove Development

APPENDIX 4: Payment Sheet for Lunch and Fair for Attendants

WODSTA:

Women Development for Science and Technology Association

P.O.BOX 3182, ARUSHA www.wodsta.org, wodstatz@wodsta.org

Phone +255736 502 359/+255 754 388 213

Payment sheet.

Activity……..

Date……..

S/N	NAME	AMOUNT	SIGNATURE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
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17			
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19			
20			

Appendix 5. Training Manual on Janja Improved Stove

Women Development for Science and Technology Association

(WODSTA)

Kitini cha Kufundishia Mafunzo Juu ya Ujenzi wa Jiko Janja

Mahitaji

1.Vifaa

2.Vitendea kazi

VIFAA

S/N	Aina ya Kifaa	Size	Idadi
1	Matofali ya kuchoma (Bricks)	Hutegemea na upatikanaji (kwa matumizi ya nyumbani mara nyingi hutumika size (21cmx10cmx6cm),kwa taasisi hutumika matofali makubwa.	Hutegemea ukubwa wa jiko
2	Saruji	50kg bag	Hutegemea ukubwa wa jiko
3	Chokaa	25kg bag	Hutegemea ukubwa wa jiko
4	Mlango	Hutegemea ukubwa wa jiko	Hutegemea idadi ya matundu (Plates) yanayohitajika.
5	Bangili	Hutegemea ukubwa wa sufulia itakayotumika	Hutegemea idadi ya matundu (Plates) yanayohitajika.
6	Dohani	Upana na urefu hutegemeana na ukubwa wa jiko na urefu wa ukuta	Dohani moja inaweza kuhudumia tundu moja au mawili hadi matatu.
7	Mchanga	Ndoo 10 ndogo kwa jiko la familia ya watu 6 hadi 10,Mkokoteni /Pickup au zaidi kwa majiko makubwa (Taasisi)	Hutegemea ukubwa wa jiko.
8	Wiremesh	Hutegemea ukubwa wa jiko	Hutegemea ukubwa wa jiko

Vitendea Kazi

1. Futi kamba

2. Kamba

3. Karai/Ndoo

4. Beleshi

5. Mwiko

6. Mkonobao

7, Pima maji

8. Panga

9. Nyundo (ndogo)

10.Kobilo

Matayarisho Kabla Ya Ujenzi

Kagua eneo linalotarajia kujengwa kuona kama linafaa (Mambo yafuatayo huangaliwa)

-Ukubwa wa eneo kama unatosha kujenga jiko husika

-Kama kuna uelekeo mzuri wa hewa/upepo

-Namna dohani litakavyokaa

-Kama mawe/Kokoto vitahitajika endapo sehemu inayojengwa haina sakafu n.k.

Kipimo cha Mchanga,Saruji na Chokaa na Namna ya Kutayarisha Motta

1.Pima mchanga vipimo kumi,Saruji kipimo kimoja na Chokaa kipimo kimoja.

(Kwa uwiano wa 10:1;1)

2.Changanya Mchanga,Saruji na Chokaa kwa beleshi hadi vichanganyikane vizuri ili kupata

Motta yenye ubora unaotakiwa.

3.Weka maji ya kutosha kwenye mchanganyiko wa Mchanga,Saruji na Chokaa kisha koroga

kwa kutumia beleshi hadi mchanganyiko uwe tayari kwa kujengea.

Sehemu Kuu za Jiko Janja

Jiko janja lina sehemu kuu zifuatazo:-

1.Chumba cha hewa

2.Chumba cha moto

3.Chumba cha sufulia

4 Dohani.(Sehemu ya kutoa moshi)

Hatua ya Kwanza

Ujenzi wa chumba cha hewa na majivu.

i) Tandaza motta katika eneo lote linalojengwa kisha isawazishe kwa mkono bao,halafu hakikisha kwa kutumia Pima maji kwa ajili ya kupata usawa(Kama hakuna sakafu anza kwa mawe au kokoto ili kuweka msingi wa jiko,kisha endelea).
ii) Weka tofali moja kila kona kwa kufuata urefu na upana wa jiko unalohitaji kujenga, hakikisha kwa futi kamba ili kupata urefu na upana unaolingana na mahitaji yako.
iii) Baada ya kupata urefu na upana pima ulalo kwa kutumia futikamba au kamba ili kuepuka kujenga jiko lililopinda

iv) Funga kamba katika matofali uliyoweka katika kona zote nne,kamba ipite kwa nje na ifunge kwa uangalifu ili matofali yasipoteze kipimo,kisha panga tofali kufuata kamba ukiacha nafasi ya sentimita mbili au zaidi (joint) kati ya tofali na tofali.

v) Hakikisha unaacha nafasi ya chumba cha kupitisha hewa na majivu (upana na urefu wake hutegemea saizi ya jiko).Mara nyingi kwa jiko dogo la familia ya watu kati ya 6 hadi 10 chumba cha hewa huwa upana cm 10 x kina cm 8-10 x urefu cm 37.

vi) Pima na pimamaji ili kupata usawa wa matofali yaliyooka vizuri.

vii) Jaza nafasi itakayokuwa wazi kwa kupanga matofali

viii) Kisha jaza nafasi iliyo kati ya tofali na tofali kwa motta kwa kutumia mwiko na mkono bao.

ix) Tandaza motta sehemu yote ya juu kisha weka matofali kwenye kona halafu pima na pima maji kupata usawa.Funga kamba kwenye kona zote kisha panga matofali halafu hakikisha kwa pima maji, kisha jaza matofali katika nafasi iliyobaki wazi ukiacha nafasi kati ya tofali na tofali,baaba ya kurizika na usawa wa matofali ziba joint kwa motta.

x) (Kujenga chumba cha hewa na majivu.

Hatua Ya Pili

Ujenzi wa chumba cha moto (Upana, urefu na kina hutegemea ukubwa wa sufuria zinazotakiwa kutumika)

i) Chukua mota uitandaze pote juu ya ujenzi wa kwanza unene unaohitaji . Kisha anza kwa kupima katikati ya chumba cha hewa/majivu,ukishapata katikati weka alama hadi mwisho wa chumba cha hewa/majivu. Lengo la kupima na kuweka alama ni kuhakikisha kwamba chumba cha hewa/majivu kinakaa katikati cha chumba cha moto ili hewa ipulize kuni kuongeza ufanisi katika uwakaji,pia kuni zikiisha ungua majivu yaweze kupita kwa urahisi yasirundikane na kuzuia uwakaji wa kuni.

ii) Kisha unapima kuanzia katikati ya msitari ulio uchora kwenye chumba cha majivu/hewa kuelekea pembeni na pembeni kutegemeana na ukubwa wa chumba unaoutaka. e.g kwa matumizi ya familia ya watu wapatao 6 hadi 10 mara nyingi chumba cha moto huwa na ukubwa wa sentimita kumi na nne (14) kwa kufuata urefu wake hadi mwisho na kina cha sentimita 20 hadi 27. Kipimo cha ujenzi huanza kwa kupima kuanzia mstari uliowekwa katikati ya chumba cha hewa,endapo kusudio lako ni kujenga chumba cha moto cha ukubwa wa sentimita 14 x 14, basi unapima sentimita saba kila upande halafu ualaza matofali hadi mwisho wa chumba na kuyanyoosha kwa pima maji ili kupata usawa wa matofali yaliyonyooka, kisha unajaza jointi kwa motta.Unapomaliza chumba cha moto kwa juu huonekana tundu la urefu na upana wa 14cm x 14cm. Baada ya ujenzi wa chumba cha moto endelea na unjenzi wa jiko kwa kujenga matofali pembeni ya jiko hadi ulipofikisha kimo cha ujenzi wa chumba cha moto.

Hatua Ya Tatu

Ujenzi wa chumba cha sufulia

(i) Tandaza motta juu ya ujenzi wa chumba cha moto kabla ya kuanza kupimachumba cha sufuria.
Namna ya kwanza weka sufuria katikati ya tundu ambalo lina urefu na upana wa sentimita 14 x 14. Namna ya pili ni kuweka bangili utakayotumia unailaza kuzunguka tundu la chumba cha moto halafu unapima kwa futikamba ili tundu likae katikati kisha unaweka alama nyuma ya bangili.Baada ya hapo kata matofali urefu unaolingana na kina cha sufuria halafu zipange kuzunguka sufuliaau kufuata alama uliyoweka nyuma ya bangili ukiwa unaacha nafasi ya sentimita moja au mbili kuzunguka sufuria, Katuka eneo hili tofali moja hukatwa nusu kwa ajili ya **nafasi ya kutoa moshi nje ya jiko.**

Baada ya hapo funga jointi kwa motta. Panga matofali kuzunguka jiko pande zote kwa nje, pima kwa pima maji ili kupata usawa kisha ziba jointi kwa motta.Halafu jaza nafasi ilyobaki wazi kwa matofali na motta. Baada ya hopo **laza bangili** juu ya matofali ya chumba cha sufuria,kata matofali ili masikio ya bangili yatumbukie,hakikisha imelala sambamba na matofali kisha weka pima maji ili kupata usawa ukishapata usawa weka motta kuziba sehemu ulizokata wakati wa utumbukiza masikio ya bangili. Kisha pima wiremesh ukilinganisha na urefu na upana wa jiko,kisha ilaze juu ya jiko,halafu weka alama kufuata mzunguko wa bangili kwa kutumia markerpen au chaki kisha kata kwa wiremesh katika sehemu ulizoweka alama kwa kutumia prier.**Laza wiremesh** juu ya jiko na hakikisha kuwa bangili zinapita vizuri halafu weka mota juu ya hiyo ware mesh kwa kutumia kibao na mwiko.Sawazisha mpaka juu ya jiko pawe na usawa wa pima maji.Baada ya hapo malizia kwa kuweka neru.

Hatua ya Nne

Ujezi wa Dohani (sehemu ya kutolea moshi)

Dohani hujengwa kwa lengo la kutoa moshi ndani ya jiko hivyo inaweza kujengwa nje ya jiko au ndani ya jiko kutegeana na eneo linalojengwa au nafasi ya eneo husika.Kwa kawaida dohani hujengwa kwa kufuata tundu lililoachwa wazi katika ukuta wa jengo ambapo vipimo vinapopimwa tundu hutakiwa kubaki katikati ya dohani ili liweze kufanya kazi vizuri.Ikiwa unajenga dohani kwenye ukuta utatumia matofali 2½ kwa kila line,ukishafika juu ya ukuta yaaniukifikia bati unatumia matofali 4 kwa kila line. Ukisha maliza bandika mfuniko wa kuzuia maji ya mvua kuingia ndani ya doahani na kwenda kuzima moto.Mfuniko hubandikwa tu

haujengewi kwa motta ili kurahisisha uzibuaji wa dohani endapo litaziba kutokana na matumizi ya muda mrefu au matumizi ya kuni mbichi.

Mfuniko hutengenezwa kwanza kwa kutengeneza **fremu** yenye urefu na upana unaohitajika kisha hukorogwa mota ammbayo huzidishwa saruji kdogo ili iwe kali harafu kipande cha **wiremeshi** chenye urefu na upana wa frem hutayarishwa,halafu eneo ambapo mfuniko utatengenezewa hutayarishwa kwa kusawazishwa na kupimwa kwa pima maji kisha hutangilizwa karatasi **ya nylon au namna nyingine**,baada matayarisho unajaza motta kiasi halafu weka kipande cha wiremesh na malizia kujaza motta hadi ijae na sawazisha kwa mkono bao.

Faida za Jiko Janaja

1. Linatumia kuni chache.
    - Linaongeza kipato cha familia.(Kwa kupunguza manunuzi ya kuni).
    - Linaokoa miti isikatwe kwa wingi. (Ongezeko la uoto wa asili,na mazingira bora ya kupata mvua)
2. Linatumia muda mchache kuivisha chakula
    - Linampa mpishi muda wa kufanya shughuli zingine za uzalishaji/maendeleo.(Bustani/shamba,mifugo,kujisomea,kupumzika n.k.)
3. Linatoa moshi nje ya jiko.
    - Linapunguza magonjwa yanayotokana madhara ya moshi kwa wapishi kwa zaidi ya 70%.(macho,mapafu na kichwa kuuma)
    - Linadumisha usafi wa jikoni(Akina baba wanashiriki kupika)

Hasara Za Jiko Janja

Hasara ya kutumia jiko hili ni kwamba huwezi kuota moto wakati wa baridi.

IMEANDALIWA NA:

Deogratius M.Tungaraza

WODSTA: 2013 - 2014

- M W I S H O -

Appendix 6. Attendance Sheet for Groups Participants in Training

Women Development for Science and Technology Association (WODSTA)
P.O.Box 3182, Arusha,
Phone +255736 502 359/+255 754 388 213
Email; wodstatz@wodsta.org, WEBSITE: www.wodsta.org

ATTENDANCE SHEET

ACTIVITY……

LOCATION……

DATE…….

S/N	FULL NAME	PHONE NUMBER	SIGNATURE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Appendix 7. Questionnaire for Monitoring and Evaluation

Women Development for Science and Technology Association (WODSTA)
P.O.Box 3182, Arusha,
Phone +255736 502 359/+255 754 388 213
Email; wodstatz@wodsta.org, WEBSITE: www.wodsta.org

MONITORING AND VALUATION TOOL FOR PROMOTION OF RENEWABLE

ENERGY PROJECT

A; CLIENT DETAILS

Name:……

Age ……

Boma …….

Ward ……
Village……..Sub-village…….....

District ……

Region …….

Family size ……

Contact ……

B: SITUATION ANALYSIS:

1. History of Old Technologies

1. What new technologies have you adopted after the awareness raising/training?
……
…

2. What type of technologies were you using before adopting this new technology?

……
……

3. How much were you spending for fuel on the old technology?

(a) Daily ……..

(b) Weekly ……..

(c) Monthly ……..

4. What is the situation in the cooking place is this kitchen or what? In terms of smoke.

(a) Too much smoke ☐

(b) Less/Moderate smoke ☐

(c) No small at all. ☐

5. Are you aware of effect of indoor smoke ☐ ☐

(If yes explain)

……
……
……

II: SITUATION AFTER ADOPTING NEW TECHNOLOGIES

1. What quantity of fuel do you spend on the new technology?

(a) Daily …….

(b) Weekly …….

(c) Monthly ……

2. What is smoke situation place after adopting the new technologies?

(a) No smoke ☐

(b) Less/Moderate smoke ☐

(c) Too much smoke ☐

3. Has a new technologies cut down expenditures on fuel as compared to the old technologies?

YES ☐ NO ☐

If yes how much have you been able to save?

(a) Daily ……
(b) Weekly ……
(c) Monthly ……

4. Has the new technologies cut down the quantity of fuel as compared to the old technologies?

YES ☐ NO ☐

If yes how much have you been able to save?

(a) Daily ……
(b) Weekly ……..
(c) Monthly……

5. In the term of hygiene, how comfortable is the kitchen environment?

(a)Before adopting new technology ☐

(b) After adopting new technologies ☐

6. How do you categorize the new and old technologies in terms of fast cooking (Which one cooks efficiently?)

(a) The old technology cooks fast than the new technology ☐

(b) The new technology cooks faster more than the old technology ☐

7. Do you have easy access to the renewable energy technologies and fuel for the same?

If yes:

(a) How far (where)?.....
(b) How much? Tsh…… Per ……
(c) How frequently?.....

8. How the new technologies by any way helped conserved the environment?

YES ☐ NO ☐

If yes how

……

……

9. Has the new technologies reduce the time you were using to search for fuel in the past ?

YES ☐ NO ☐

(IF yes, how to do you use the time gained

For?.....……
…… .....……

C: ABOUT ENERGY KIOSKS AND PUBLIC INSTITUTION DISPLAY CENTRES

1. Do you know any RET kiosk in your village? If yes what do you know about it?
……

2. Is the kiosk meeting your RETs demand? YES ☐ NO ☐

3. Do they meet your expectations especially in providing renewable energy services?

YES ☐ NO ☐

If no what do you suggest for the kiosk to improve?

……
……
……

4. Do you have any public institution in your village where RETs are installed?

5. Do you have access to learn about RETs in the public institutions where the technologies are installed? YES ☐ NO ☐

6. Are technologies being effectively at the public institution?

YES ☐ NO ☐

D: SUGGESTIONS

7. What suggestion do you have with regard to the use of Renewable Energy Technologies?

8. What advice do you have for the households that have not started using Renewable energy technologies?